PROPOSED EXPANSION OF GERMAN AIR FORCE OPERATIONS AT HOLLOMAN AFB, NEW MEXICO

FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME I:
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UNITED STATES AIR FORCE

APRIL 1998

PROPOSED EXPANSION OF GERMAN AIR FORCE OPERATIONS AT HOLLOMAN AFB, NEW MEXICO

VOLUME I: FINAL ENVIRONMENTAL IMPACT STATEMENT

Prepared for
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Langley Air Force Base, Virginia

Prepared by
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Fort Worth District
Fort Worth, Texas

APRIL 1998

COVER SHEET

a. Responsible Agency: U.S. Air Force

b. Cooperating Agency: U.S. Army

c. Proposals and Actions: The U.S. Air Force proposes to beddown 30 additional German Air Force (GAF) Tornado aircraft and 640 personnel at Holloman Air Force Base (AFB), New Mexico. Construction affecting 96 acres at Holloman AFB would be required. The GAF Tactical Training Establishment (TTE) at Holloman AFB would conduct five different training courses ranging from basic conversion training to the Fighter Weapon Instructor Course. In order to meet the training needs of the Tornado aircrews, three training options are being considered. These training options include the same basic elements, and differ only with respect to use of airspace and ranges. These options include: (1) constructing a new target complex (NTC) on western Otero Mesa on McGregor Range; (2) constructing an NTC in the Tularosa Basin portion of McGregor Range; and (3) using existing target areas for air-to-ground training (Existing Range training option). The Air Force's preferred option is establishment of an NTC on west Otero Mesa. The Air Force is also considering a No-Action alternative. Under this alternative, no change in personnel or aircraft at Holloman AFB would be implemented. No construction would be required to support this alternative. In addition, no change in airspace use or munitions use would occur.

d. **For additional information:** 49th Fighter Wing Public Affairs, 490 1st Street, 2800 Holloman AFB, New Mexico, 88330-8287, or Ms. Sheryl Parker, EIS Project Manager, U.S. Air Force, Air Combat Command/CEVP, 129 Andrews Street, Suite 102, Langley AFB, Virginia, 23665-2769.

e. Designation: Final Environmental Impact Statement

f. Abstract: This Final Environmental Impact Statement has been prepared in accordance with the National Environmental Policy Act. The document includes analyses of the potential environmental consequences that the proposed action may have on airspace, noise, land use, air quality, biological resources, archaeological, cultural, and historical resources, water resources, hazardous materials and waste management, socioeconomics, transportation, utilities, soils, and safety. The findings indicate that potential environmental impacts from the proposed action and all training options would include increased aircraft-related noise in some portions of the affected airspace, slight to moderate impacts to biological resources, overflight disturbance to land use, and positive economic growth.

EXECUTIVE SUMMARY

PURPOSE AND NEED

The United States Air Force (USAF) proposes to beddown 30 additional German Air Force (GAF) Tornado aircraft and associated operations and support personnel at Holloman Air Force Base (AFB), New Mexico.

Background

In recent years there have been changes in international requirements and reductions in the military budgets of the United States. These changes have established a need to foster combined action capabilities for the military forces of many nations to work together to meet specific threats. These combined action capabilities permit substantial reductions in each nation's military force, while concurrently creating the larger force necessary to permit response to international requirements. This philosophy establishes a need for military personnel from different nations to achieve a uniformly high standard of training and proficiency, and forge the strongest possible team. This policy is reflected in the current *U.S. National Military Strategy,* which emphasizes peacetime engagement by way of military-to-military contacts through international training and military exchanges. The results of these contacts help build mutual trust, effective communications, interoperability, and doctrinal familiarity. Germany is an important ally of the United States and has provided aircrews to support recent combined force missions. The United States government, following discussions with the German government, recognized a need to provide training with enhanced realism and quality for GAF Tornado aircrews. This led to the signing of a Memorandum of Agreement between the United States and German governments in May 1994, establishing the GAF Tactical Training Establishment (TTE) at Holloman AFB. In May 1996, 12 Tornado aircraft relocated to Holloman AFB.

In 1995, the two countries held discussions about the potential expansion of GAF Tornado training in the United States. The U.S. proposal to locate the GAF training operation at Holloman AFB was based on several factors. These include collocation of the German Tornados and the German F-4 training program (recently moved from George AFB to Holloman AFB, and conducted by the U.S. Air Force 20th Fighter Squadron) would reduce German costs by allowing for economies of scale. Second, the proximity of a large German community at Fort Bliss, approximately 920 German military and dependents, would reduce the logistics support requirements. The Germans operate a shuttle between Germany and the U.S. that flies into and out of El Paso, Texas. This shuttle is used for personnel and supplies from Germany. Third, Holloman AFB provides cross-training opportunities with German missile training units located at nearby Fort Bliss in El Paso. Fourth, Holloman AFB had the apparent capacity and the Military Training Routes (MTRs), Military Operations Areas (MOAs), and ranges to provide the requested training. Fifth, the German Command Element is located in El Paso, which keeps the German training unit close to the headquarters. All these factors directly contributed to the decision to locate the GAF TTE at Holloman AFB.

Proposed Action and Alternatives

Under the proposed action, the TTE would be expanded at Holloman AFB. The TTE would conduct five different training courses ranging from basic conversion training to the Fighter Weapon Instructor Course. The Tornado aircrews would receive training including takeoffs and landings, the use of terrain-following radar for low-level navigation on Military Training Routes (MTRs), air-to-ground training on air-to-ground ranges, air-intercept training in Military Operations Areas (MOAs) and restricted airspace, as well as aerial refueling. To support the training, Television Ordnance Scoring Systems (TOSS) would be installed at the Oscura and Red Rio target complexes on White Sands Missile Range (WSMR). Expansion of the TTE would include the beddown of an additional 640 personnel and 30 Tornado aircraft at Holloman AFB. To support this beddown, construction affecting approximately 96 acres at the base would be required.

Three training options are being considered to meet these training requirements. Existing ranges would be used to support all three training options. Live munitions deliveries would be restricted to the existing Red Rio Live Drop Target (LDT).

- **West Otero Mesa Training Option.** Under this option, a new target complex (NTC) would be established on the west Otero Mesa portion of McGregor Range. The NTC would be used for air-to-ground training in the delivery of inert/subscale munitions. Construction of the NTC would disturb 1,104 acres; continued use (i.e., bombing and maintenance) would disturb 1,024 acres. This option would include the installation of a TOSS at the NTC. This is the preferred option.

- **Tularosa Basin Training Option.** Under this option, an NTC would be established in the Tularosa Basin portion of McGregor Range. This NTC would be used for air-to-ground training in the delivery of inert/subscale munitions. Construction of the NTC would disturb 5,200 acres; continued use (i.e., bombing and maintenance) would disturb 1,024 acres. This option would also include the installation of a TOSS at the NTC.

- **Existing Range Training Option.** Under this option, all air-to-ground training would occur on existing ranges.

The West Otero Mesa training option was selected as the preferred option for a number of operational and environmental reasons. The deficiencies in the other options and the reasons for selecting the West Otero Mesa training option are described in the following discussion.

The Existing Range training option was not selected as the preferred option because it provides only minimally adequate training for GAF aircrews and does not have the training benefits and efficiencies of the other options. In addition, the increased range use from this option has the potential to significantly degrade current U.S. Air Force operations and training.

The Tularosa Basin training option was not selected as the preferred option because the layout of the terrain would result in a 20 percent reduction in training efficiency compared to the West Otero Mesa training option. Two other others factors are the extensive disturbance required to prepare for and construct the NTC, and the attendant prohibitive cost of this option.

The West Otero Mesa training option provides the maximum training opportunity for both GAF and U.S. Air Force training. In addition to the greater opportunity for training, this option also provides for the greatest training versatility and efficiency. Finally, NTC construction would be confined to a significantly smaller geographical area than the Tularosa Basin training option and would be a fraction of the cost.

The proposed action would result in changes in use of airspace and munitions. Under all training options, various MOAs, Restricted Areas, and MTRs in the area would be used for flight operations. Airspace use would increase in most affected airspace. Supersonic operations would be limited to approximately 24 sorties per year in WSMR airspace (above 10,000 feet mean sea level [MSL]).

The proposed action would make use of airspace modifications analyzed in an independent previous proposal. That proposal (*Proposed Airspace Modifications to Support Units at Holloman Air Force Base, New Mexico* [U.S. Air Force, 1997a]) involves airspace modifications in southern New Mexico and west Texas. A Finding of No Significant Impact was signed for that Environmental Assessment (EA) in June 1997. The document is referred to as the "ALCM/Talon EA" in this Environmental Impact Statement (EIS). The ALCM/Talon action involves modifications of existing Air Launched Cruise Missile (ALCM) routes to form consolidated MTRs (Instrument Routes [IR]-102/141). That action would expand Talon MOA in central New Mexico to the west and south. It would also lower the floor of the southwest portion of the MOA to 300 feet above ground level (AGL). Finally, that action would establish an aerial refueling anchor, AR-X652, in west Texas. If implemented, these airspace modifications would also be used by the additional 30 Tornados; if these airspace modifications are not implemented, existing airspace would be used. This would result in a redistribution of sorties to other affected airspace. These differences in airspace availability and use are taken into account in the analysis of impacts associated with the beddown of the Tornado aircraft at Holloman AFB.

The U.S. Air Force is also considering a No-Action alternative. Under this alternative, the proposed changes in personnel and aircraft at Holloman AFB would not occur.

ENVIRONMENTAL CONSEQUENCES

The Proposed Action

This Final EIS describes the environmental impacts associated with the implementation of the proposed action. Additional information has been added to address comments received during the public comment period following publication of the Draft EIS. Most resource areas have been expanded to some extent in response to such comments. Some of the areas which have received expanded coverage include: the description of noise analysis methodology, threatened and endangered species, the effect of overflight on rural socioeconomics and property values, and impacts to grazing and ranching activities. Fiscal year 2000 (FY00) has been selected as the environmental baseline for purposes of comparison and analysis in this document. Baseline conditions are described as those that will exist just prior to the time the proposed increase in flying operations would begin in FY00. If the proposed action is selected, some construction and personnel and aircraft movement would have to occur before FY00 to achieve the ability to commence flying operations by that date.

Airspace Use and Management. The proposed action does not involve any modifications to existing airspace. All of the training options being considered would make use of the airspace modifications considered under the previously assessed ALCM/Talon action. Overall, assessment of each affected airspace unit found that the projected number of sorties would result in little change to the FY00 daily average sortie levels for each area. This conclusion remains the same for all three training options. Implementation of the proposed action would have little effect on use and would not affect management of this airspace.

Noise. Implementation of the proposed action would result in an increase in noise levels in the vicinity of Holloman AFB, compared to the FY00 projected baseline. The area contained within the 65 decibel (dB) day-night average sound level (L_{dn}) contour[1] around the base would increase by about 12 percent. Under the NTC training options, average noise levels in areas underlying MTRS and MOAs would range from 35 dB to 59 dB . Higher average noise levels would prevail beneath restricted airspace, particularly in the vicinity of target complexes within WSMR, McGregor, and Melrose Range. Overall average noise levels in these areas would be 63 dB or less, though at the individual target complexes average noise levels would reach 80 dB. With respect to the proposed NTC itself, average noise levels of 80 dB would occur in the immediate vicinity of the target complex. Average noise levels of 62 dB would occur along the centerline of the flight patterns within the restricted areas. Noise levels would drop off rapidly with distance from the centerline of these flight patterns, falling to levels under 45 dB within one mile of the centerline.

[1] Noise levels are presented in this Executive Summary as day-night averages (L_{dn} and L_{dnmr}) in decibels (dB). All noise measures used in the EIS are fully explained in Section 3.2. As explained in Section 4.2, 65 dB is a benchmark often applied to determine residential land use compatibility around airports or highways.

In most areas, average noise levels would change by 2 dB or less from the baseline levels that would otherwise prevail in FY00. This difference would not be perceptible to most people. Noticeable changes in average noise levels between 5 and 7 dB would be limited to areas under IR-192/194, portions of IR-134/195, and in a portion of IR-113 underlying Pecos MOA.

Under the Existing Range training option, the average noise levels along MTRs and MOAs would range from 35 dB to 61 dB. Higher average noise levels would prevail beneath restricted airspace, particularly in the vicinity of target complexes within WSMR and Melrose Range. Overall average noise levels in these areas would be 64 dB or less, though at the individual target complexes average noise levels would reach about 80 dB. In most areas, average noise levels would change by 2 dB or less from the levels that would otherwise prevail in FY00. This difference would not be perceptible to most people. Noticeable increases in average noise levels between 5 and 7 dB would be limited to areas under portions of VR-125, VR-176 and Beak MOA. Substantial changes in the noise environment (more than 7 dB) would occur under portions of Pecos MOA, Beak MOA, and where VR-125 and IR-113 enter Melrose Range airspace.

Land Use. It is expected that land use patterns at Holloman AFB and the surrounding vicinity would remain unchanged under the proposed action. Projected increases in noise exposure at the base would not result in an appreciable increase in noise exposure for on-base housing and community services. The use of surrounding off-base areas that are undeveloped or used for livestock grazing would be unaffected. White Sands National Monument adjoins Holloman AFB and would experience an increase of less than two square miles in the amount of area exposed to L_{dn}65 dB or higher.

Exposure to aircraft overflight and associated noise increases. In general, areas under the affected airspace would receive less than one additional sortie a day, resulting in imperceptible or minor increases in day-night averaged sound levels of 1 to 3 dB. Some areas (in Eddy and Otero counties in New Mexico, and Hudspeth and Culberson counties in west Texas) would experience noticeable increases in sound levels of 5 to 7 dB.

FAA, U.S. Air Force, and GAF regulations specify minimum altitudes and avoidance distances aircraft must adhere to when flying over specific types of structures, settlements, or categories of land. For example, U.S. Air Force regulations require aircrews flying over sparsely populated areas to avoid persons, vessels, vehicles and structures by at least 500 feet. GAF regulations increase some of these avoidance distances further. Even with these avoidance distances, it is possible that there may be perceptible increases in noise levels for some rural residents. Aircraft overflight of several Wilderness Areas (Blue Range, Withington, Capitan Mountains, White Mountains, Apache Kid, Aldo Leopold, and Gila) would result in 1 to 4 dB increases in average noise levels. In any case, average noise levels in these areas would not exceed 50 dB. Typical low-level overflights would be short in duration, and in accordance with applicable regulations. Some wilderness users may be startled by aircraft noise. These projected changes in the noise environment are not expected to result in any changes in land use.

Under the NTC training options, the NTC would be located on public land within McGregor Range, currently withdrawn under Public Law 99-606, Military Lands Withdrawal Act of 1986. The withdrawal expires in November 2001; continued military use of the land would require application to renew the withdrawal of McGregor Range and approval by Congress. Portions of McGregor Range are currently open to the public for grazing and recreation. Training activities on the NTC would require that portions of areas south of State Road 506 be closed to the public for approximately 60 hours per week, from Monday through Friday. State Road 506 itself would not be closed under the proposed action. A permit is required in order for members of the public to obtain access to McGregor Range.

Establishment of the proposed NTC on west Otero Mesa would remove 5,120 acres from public access, converting about 10 percent of grazing units 9 and 13 to exclusive military use. This would reduce available grazing land on McGregor Range by about two percent, resulting in a loss of about 450 Animal Unit Months (AUMs). The loss in grazing land and AUMs would not change overall land use of the area. Access to grazing lands within the safety area south of State Road 506 would be restricted when the NTC is in use. Maximum L_{dn} noise levels in areas beyond the impact area, due to the use of the proposed NTC, are projected to reach 62 dB. These noise levels are comparable with noise levels on other ranges supporting grazing activity (e.g., Melrose Range in New Mexico, and Avon Park Range in Florida). They are considered compatible with existing grazing activities on McGregor Range. Noise levels at the nearest residence east of the NTC would be about 43 dB, a level compatible with residential use.

The Tularosa Basin NTC site is within the existing impact area of McGregor Range; as such, it has been closed to public access since its initial withdrawal in the 1950s. The Tularosa Basin impact area has been heavily used by the Army for many years. It is not currently suitable for general public use due to hazardous debris and potential unexploded ordnance (UXO) throughout this area. Construction and use of the NTC at this location would not displace any existing grazing leases on McGregor Range. However, use of this site would result in restricted access to grazing land within the safety area south of State Road 506 while the NTC is in use. Noise levels at the nearest residence east of the NTC would be about 43 dB, a level compatible with residential use.

Under the Existing Range training option, land use impacts for areas underlying affected airspace would be similar to those discussed for the NTC options. Some areas would experience substantially greater aircraft activity; overall, noise levels under MTRs and MOAs would not exceed L_{dn} 61 dB. Projected increases of 12 dB under IR-113 and Pecos Low MOA in De Baca and northern Chaves counties would be noticeable. Most underlying areas have extremely low population and are used for cattle grazing; therefore, land use impacts would be minimal. In general, the increases in overflight and accompanying noise under the Existing Range training option are not considered to be significant in terms of their effect on land use.

Air Quality. Implementation of the proposed action would result in construction-related emissions at Holloman AFB and the Red Rio target complex on WSMR. Under the NTC training options, construction would also occur on McGregor Range. In all cases, the resulting emissions would be temporary in nature, and would not result in exceedances of air quality criteria. The annual cleanup and routine maintenance operations at the existing ranges and at the proposed NTC would also result in emissions related to construction-type activities, including fugitive dust. Changes in emissions from vehicle operations and stationary sources at Holloman AFB would not be expected to result in significant adverse impacts on air quality. The proposed increase in airspace use under either the NTC or Existing Range training options would result in increased emissions affecting air quality. The effects of these increases were examined using the Multiple Aircraft Instantaneous Line Source (MAILS) model. Results of this analysis indicate that in no case would implementation of the proposed action result in exceedances of national or state ambient air quality standards. Implementation of the proposed action would not be expected to result in any adverse change in air quality leading to nonconformance with the Environmental Protection Agency's (EPA's) Conformity Rule or the Clean Air Act.

Biological Resources. Implementation of the proposed action would affect biological resources through facilities construction, changes in aircraft operations in affected airspace, and delivery of ordnance against existing and proposed targets.

Placement of the fiber-optic cable and TOSS sites on WSMR would result in disturbance of 10 acres. On-base facility construction would result in the disturbance of 96 acres within or immediately adjacent to the developed area of Holloman AFB. Most of this area has been previously disturbed. However, about 15 acres of relatively undisturbed habitat immediately adjacent to the existing munitions area would be disturbed. This area has burrows that may be used by burrowing owls for nesting. Burrowing owl nests are also present in areas that would be disturbed by construction near the runway apron. Holloman AFB would evaluate the location of the existing and potential nest sites in relation to construction activities and implement appropriate mitigations (e.g., construct artificial nest burrows).

No jurisdictional wetlands would be disturbed from construction, maintenance, or use of support facilities at Holloman AFB. Therefore, no impact to jurisdictional wetlands would occur. Waters of the U.S. on Holloman AFB may be disturbed to improve the stormwater drainage system. Therefore, Holloman AFB would complete the Clean Water Act (CWA) Section 404 permit process to ensure that impacts would be minimized.

Construction at Red Rio and use of Red Rio, Oscura, and Melrose Range would result in low adverse impact to biological resources. Less than 10 acres would be disturbed on Red Rio from installation of the TOSS components and fiber-optic cable. Most of this area would be a narrow linear disturbance for the fiber-optic cable immediately adjacent to existing roads. Therefore, a narrow strip of vegetation would be lost, much of which has been previously modified from construction, use and maintenance of the existing roads. During construction, animals may temporarily avoid the area because of

human presence and noise. Once construction is completed, animal use of the area should be similar to pre-construction levels. Use of the existing targets and ranges would result in loss of an additional 3.4 acres of vegetation on Red Rio and a very limited amount of vegetation on Oscura and Melrose Range. Overflights, ordnance use, and flare use on Red Rio, Oscura, and Melrose Range would result in continued low impact to wildlife. No impacts to protected and sensitive species or to wetlands would be expected from use of the existing ranges.

Construction and use of the proposed NTC under the West Otero Mesa training option would likely result in impacts to some biological resources, including the disturbance of 1,104 acres of shortgrass and desert scrub habitat. Construction and use of the NTC would reduce wildlife habitat and may reduce use of remaining habitat in the immediate vicinity of the NTC because of startle from ordnance delivery and overflights. Protected and sensitive species may be affected by construction and use of the West Otero Mesa NTC. Construction and operational requirements identified and mitigations agreed to through the Endangered Species Act consultation would be implemented to ensure that potential adverse impacts would be minimized. Up to 46,000 linear feet of dry streambeds tentatively delineated by the Corps of Engineers as Waters of the U.S. would be disturbed by construction or ordnance delivery. Therefore, field evaluations of specific sites from construction of roads, firebreaks, and targets could be performed to avoid Waters of the U.S. or to complete the permit process under Section 404 of the CWA. Some water developments within the NTC impact area support domestic animals grazing on Otero Mesa, as well as wildlife. These developments would be moved to an area immediately outside of the impact area to ensure continuity of water supply for grazing stock and wildlife.

Construction and use of the proposed NTC on the Tularosa Basin site would result in adverse impacts to some biological resources through the disturbance of about 5,200 acres of grassland and desert scrub habitat. Construction and use of the NTC would reduce wildlife habitat and may reduce wildlife use of remaining habitat in the immediate vicinity of the NTC because of startle from ordnance delivery and overflights. Protected and sensitive species may be affected by construction and use of the Tularosa Basin NTC. Protected and sensitive animals species habitat that is present on the Tularosa Basin NTC site is of lower quality or quantity compared to the habitat present at the West Otero Mesa NTC site. The likelihood of individuals of these animal species being present is less than on the West Otero Mesa NTC. Construction and operational requirements identified and mitigations agreed to through the Endangered Species Act consultation would be implemented to ensure that potential adverse impacts would be minimized.

Up to 33,240 linear feet of dry streambeds tentatively delineated by the Corps of Engineers as Waters of the U.S. could be disturbed by construction or ordnance use. Therefore, field evaluations of specific sites for the construction of roads, firebreaks, and targets would be performed to avoid Waters of the U.S. or to complete the permit process under Section 404 of the CWA.

Wildlife would continue to be overflown. Responses by individual animals would continue to range from no response, to temporary startle, to temporarily or permanently leaving the area. However, animal populations would not be expected to show any measurable response. Protected and sensitive species and habitat would continue to be overflown. Construction and operational restrictions identified and mitigations agreed to during the Endangered Species Act consultation would be implemented to ensure that potential adverse impacts would be minimized.

The Existing Range training option would not include construction and use of an NTC; therefore, associated impacts to biota would not occur. Continued overflights, ordnance use, and flare use on Red Rio, Oscura, and Melrose Range would result in continued low impact to wildlife. No impacts to protected and sensitive species or to wetlands would be expected from the continued use of the existing ranges. Overall airspace use within the region of influence would be the same; however, use of some individual blocks would change. Overall, the possibility of a sortie causing a response by wildlife would not change significantly over the projected FY00 baseline and would be similar to the NTC training options. Impacts to protected and sensitive species in existing airspace would be similar to impacts under the NTC training options.

Archaeological, Cultural, and Historical Resources. Except for the 15-acre location for the proposed munitions storage area, proposed construction on Holloman AFB would be primarily limited to the developed portions of the base and would cause ground disturbance to approximately 96 acres. One archaeological resource has been identified in the proposed munitions storage area expansion. It has been determined to be potentially eligible for listing on the National Register of Historic Places. If the proposed construction in the area cannot avoid the site, the site's significance would be formally evaluated and, if eligible, appropriate mitigation would be performed, in consultation with the New Mexico State Historic Preservation Office (SHPO) and in accordance with the National Historic Preservation Act (NHPA). No prehistoric or historic archaeological resources have been identified within the remainder of the disturbed area on Holloman AFB. Due to the level of previous disturbance in the affected area, no undiscovered resources are likely to be found. No Native American traditional cultural properties (e.g., sacred sites) have been identified on Holloman AFB, and no potentially significant historic buildings on Holloman AFB would be adversely affected by the proposed action.

Installation of TOSS components at the Oscura and Red Rio target complexes would occur under all three training options, but would require earth disturbance at the Red Rio target complex only. The U.S. Air Force is in the process of completing a cultural resources survey in the potentially affected area. Preliminary observations suggest that cultural resources may exist in the affected area, but that these resources could be avoided through project redesign.

Under the West Otero Mesa training option, construction of the NTC would affect 1,104 acres. A total of 22 archaeological sites have been identified within the entire NTC area. Of these, nine sites are considered eligible for listing on the National Register or have undetermined eligibility, while 13 are considered not eligible. No historic architectural

resources or Native American traditional cultural properties have been identified within the West Otero Mesa NTC area.

Under the Tularosa Basin training option, construction of the NTC would affect 5,200 acres. A total of 46 archaeological sites have been identified at the Tularosa Basin NTC. Of these, 21 are considered eligible for listing on the National Register, or their eligibility has not been determined, and 25 are not eligible. No historic architectural resources or Native American traditional cultural properties have been identified within the Tularosa Basin NTC area.

For any sites eligible for listing on the National Register that would be impacted by the proposed action, mitigations would be implemented in accordance with the NHPA, in consultation with the New Mexico SHPO, and in accordance with a Memorandum of Understanding between the U.S. Air Force and Fort Bliss.

Although no Native American traditional cultural properties have been identified within either NTC area, the U.S. Air Force will continue to conduct government-to-government communication with the Mescalero Apache.

Noise-induced vibration as a result of the increased number of subsonic flights within the affected airspace is unlikely to result in significant physical damage to cultural resources. It is highly unlikely that surface or subsurface prehistoric and historic archaeological sites would be adversely affected. Physical damage to historic architectural resources also would not be expected. The U.S. Air Force has initiated consultation with Native American groups who live beneath the affected airspace. This consultation is intended to elicit the tribes' concerns and comments regarding potential adverse impacts that would result from subsonic flights associated with the proposed action training options.

Supersonic flight would be confined to supersonic airspace within White Sands Missile Range restricted airspace. The number of additional supersonic flights (approximately 24 per year, all above 10,000 feet MSL) is small compared to existing use of this airspace, and is unlikely to result in any impact to archaeological, cultural, or historic resources.

Implementation of the Existing Range training option would not include construction of an NTC or associated archaeological, cultural, or historical resource impacts. Otherwise, impacts to these resources would be similar to those associated with the NTC training options.

Water Resources. Project-related construction would result in earth disturbance that could affect water resources. Construction activities at Holloman AFB, Red Rio impact area, and the proposed NTC would employ standard practices for control of runoff and infiltration as required by Federal and State laws, regulations, and permits.

Increased use of inert munitions on the existing ranges would not substantially increase soil disturbance. Increased use of live munitions at the Red Rio LDT would result in additional soil disturbance in that area. The potential for impact is limited due to the small amount of surface water in this area. Appropriate erosion control measures

would be used to minimize sediment loading in the vicinity of the LDT. These conclusions remain the same under both NTC training options as well as the Existing Range training option.

The use of inert/subscale munitions, and periodic maintenance of the target areas, firebreak roads, and access roads would result in continuing soil disturbance at the NTC. Past experience on existing ranges is that soil disturbance from the use of inert/subscale munitions is small, and localized around individual targets. The ephemeral washes draining the proposed NTC sites are not significant contributors to local surface water supply. As a result, no effect on surface water quality would be expected to result from implementation of the proposed action.

Hazardous Materials and Waste Management. Implementation of the proposed action would result in increased use of hazardous materials, as well as increased medical and hazardous waste disposal requirements at Holloman AFB. The only hazardous materials generated by range operations would be spent batteries from the proposed TOSS components and batteries removed from target vehicles. Target vehicle batteries are removed at the target storage area at the Oscura impact area, pending recycling by the Defense Reutilization and Marketing Office (DRMO). No significant impact on hazardous materials and waste management practices would be expected.

Implementation of the proposed action would result in soil disturbances in the vicinity of a site which has been has been identified under the Installation Restoration Program (IRP). Past activities in the vicinity of this site (IRP Site 59) have resulted in soil contamination from spilled fuel. Prior to construction, the work area would be over-excavated and backfilled with clean soil. This procedure is not IRP-specific and would not be designed to clean up the entire IRP site, but would isolate the work area from the remaining contamination. The excavated soil would be contained and transported to an off-base, permitted disposal facility. No other IRP site would impact construction activities in support of the proposed action.

Munitions use would increase at the Oscura, Red Rio, McGregor, and Melrose Ranges under all training options. Nonhazardous ordnance residue and target area scrap would be collected and recycled through DRMO at Holloman AFB. Under either NTC training option, approximately 150,000 additional pounds of nonhazardous ordnance residue and target area scrap would be generated each year. This 30 percent increase would not pose an environmental threat. The increased amount could be accommodated by DRMO. Under the Existing Range training option, some individual ranges would receive more munitions than they would under the NTC options, while others would receive less. The total amount of munitions involved, however, would be the same.

Range cleanup requirements vary by range classification. For example, Oscura is a Class A range and directives require that it be cleaned every two months, or every 59 use days. Red Rio is a Class C range and directives require an annual cleanup.

However, due to rapid vegetation growth, the airfield complex, firebreak, and roads are cleaned twice per year. The NTC impact area would be a Class B range that also requires annual cleanup but, as with Red Rio, if vegetation growth warrants, it would be cleaned more frequently. Areas on Otero Mesa outside the impact area would be cleared every five years.

Socioeconomics. Increases in personnel levels and construction expenditures would have a generally positive impact on local socioeconomic conditions by increasing the number of households and reducing the unemployment rate. However, after the year 2000 employment and population changes would be the same under all three training options. It is anticipated that after construction is completed, Otero County will have increased employment by an estimated 730 jobs, with 640 direct GAF personnel and 90 additional secondary jobs. The GAF jobs would be at Holloman AFB. Consistent with existing location patterns, it is anticipated that almost all of the secondary job growth would be in Alamogordo. There would be no disproportionately high or adverse effects on low-income or minority populations.

Under the proposed action, cattle grazing would be excluded from the 5,120-acre impact area. It is estimated that this loss represents a decline in agricultural production of approximately $50,000, with a loss of employment of about 0.5 jobs.

A broad area beyond Holloman AFB would experience changes in overflight due to implementation of the proposed action. These changes in overflight would not directly affect socioeconomic resources. Given the rural nature of the area and the relatively sporadic nature of overflights, the changes in overflight frequency that would result under the proposed action would not be expected to produce measurable impacts on the economic value of the underlying land.

Transportation. Implementation of the proposed action would result in increased traffic near Holloman AFB and the City of Alamogordo. The level of service for all roadway segments would be unchanged. This conclusion remains the same regardless of the training option being considered.

Utilities. Impacts of the proposed action on water supply, wastewater treatment, solid waste disposal, electrical supply, and natural gas supply were examined, both for Holloman AFB and the City of Alamogordo. In each case, while demand would increase, the resulting requirements were found to be within existing levels of service. These findings are independent of the training options being considered.

Portions of the existing wildlife and livestock water supply distribution system at the west Otero Mesa NTC site would be relocated if the West Otero Mesa training option were implemented. This would facilitate construction and avoid negative impacts on this water resource. Any relocation would be coordinated with the Bureau of Land Management.

Soils. Impacts to soils would arise primarily through earth disturbance during construction at Holloman AFB, the Red Rio target complex, and at the proposed NTC. Except for the proposed 15-acre munitions storage area location, most of the affected area at Holloman AFB is devoid of vegetation, since the soils have been previously disturbed and compacted. Considering their current state, construction of new facilities under the proposed action would cause little additional impact to these soils. The addition to the existing munitions storage area would disturb 15 acres of previously undisturbed soils. Construction associated with the Red Rio target complex would occur in a previously disturbed area, and no additional adverse effect on soils would be expected.

Increased use of inert/subscale munitions at existing target complexes (Red Rio and Oscura on WSMR, and the target complex on Melrose Range) is a fraction of existing use. Increased inert/subscale munitions use at these locations would not substantially increase soil disturbance. Use of the Red Rio LDT would increase substantially, and would be expected to increase the area of vegetation loss. This would increase soil erosion in the area. Also, past use of the LDT has led to trace amounts of residue from uncombusted explosive ordnance. The increased use of live ordnance on the LDT could lead to additional trace amounts of soil contamination.

Use of the proposed NTC would disturb soil by the use of inert/subscale munitions, as well as periodic maintenance of the surface. The net combined wind and water soil loss, in the absence of mitigative measures, could reach 14 tons/acre/year at the West Otero Mesa NTC site, depending on erosion-control measures that might be applied. Following site development and stabilization, net soil loss would be approximately six tons per year.

Construction at the Tularosa Basin site would be more extensive, due to UXO decontamination. Soil loss at this site could reach 62 tons/acre/year, an increase of 53 tons/acre/year above current soil loss levels. After site development, soil loss would range from 9 to 62 tons per year, depending on erosion-control measures that might be applied, and the extent of revegetation.

Implementation of the Existing Range training option would include the same construction activities as those of the other training options, except that an NTC would not be established. As a result, construction-related effects on soils would be similar to those described for Holloman AFB and at the existing targets. Munitions use would increase at some existing target complexes over the usage described for the NTC options. This increase, however, would be a fraction of that described for the proposed action.

Safety. Implementation of the proposed action would not adversely affect safety. The increased number of flying hours associated with the proposed action would not result in a statistically significant increase in the overall risk of an aircraft mishap. Data on bird-aircraft strike hazards indicate no significant change in bird-aircraft strike risk. The proposed levels of munitions use and handling represent an increase over current conditions. Range operating procedures that have ensured safe operation in the past

would continue to do so in the future, and no significant impact would occur due to implementation of the proposed action. This conclusion is the same for both NTC training options as well as the Existing Range training option.

No-Action Alternative

Implementation of the No-Action alternative would involve no change in aircraft or personnel based at Holloman AFB. No construction would be required, and no change in use of airspace or munitions over the projected FY00 baseline would occur. In consequence, no change in environmental conditions would result from the implementation of this alternative.

Cumulative Impacts

This EIS addresses cumulative impacts of the proposed action in combination with other actions which have been recently implemented or are reasonably foreseeable. A comparison is made of conditions that prevailed in FY95 with those that would exist under the proposed action. This comparison indicates that, for most resources, no significant cumulative impacts would be expected following implementation of the proposed action. These resources include: airspace management, air quality, archaeological, cultural and historical resources, water resources, hazardous material and waste management, safety, utilities, transportation, and soils. The comparison indicates that cumulative impacts would be expected for noise, land use, biological resources, and socioeconomic resources. These impacts include a cumulative increase in aircraft overflights and increased noise levels on one coincident route. This would, in turn, increase the chance of disturbance and annoyance in residential and recreational areas underlying affected airspace. It would also increase potential for overflight of federally listed species and other sensitive resources. Positive cumulative socioeconomic impacts would arise through various development projects being considered for Otero County. The local economy is expected to be able to provide for and benefit from the services needed for the construction personnel and the level of growth that would be associated with these projects.

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ACRONYMS AND ABBREVIATIONS

AAA	antiaircraft artillery
AADT	annual average daily traffic
AAQS	ambient air quality standards
ACC	Air Combat Command
ACEC	Areas of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACR	Armored Cavalry Regiment
ADA	Air Defense Artillery
AFB	Air Force Base
AFI	Air Force Instruction
AFR	Air Force Regulation
AGE	aerospace ground equipment
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
ALCM	Air-Launched Cruise Missile
AMRAAM	Advanced Medium-Range Air-to-Air Missile
APZ	Accident Potential Zone
AQB	Air Quality Bureau
AQCR	Air Quality Control Region
ARs	Aerial Refueling Routes
ATACMS	Army Tactical Missile System
ATC	air traffic control
ATCAA	Air Traffic Control Assigned Airspace
AUM	animal unit month
BAI	Backup Aircraft Inventory
BASH	Bird-Aircraft Strike Hazard Program
BLM	Bureau of Land Management
BMP	Best Management Practices
BNA	block numbering area
CAA	Clean Air Act
cc	cubic centimeter
CEQ	Council of Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CWA	Clean Water Act
CY	calendar year
dB	decibel
dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DFCS	Defense Fuels Supply Center
DNL	Day-Night Average Sound Level
DOD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
ECM	Electronic Countermeasures
EIS	Environmental Impact Statement

ACRONYMS AND ABBREVIATIONS (continued)

EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
ERINT	Extended Range Intercept Technology
FAA	Federal Aviation Administration
FAADS	Forward Area Air Defense System
FEBA	Forward Edge of Battle Area
FAR	Federal Aviation Regulations
FEIS	Final Environmental Impact Statement
FICUN	Federal Interagency Committee on Urban Noise
FL	Flight Level
FLIP	Flight Information Publication
FLPMA	Federal Land Policy and Management Act, 1976
FONSI	Finding of no Significant Impact
ft^2	square feet
FWIC	Fighter Weapon Instructor Course
FY	fiscal year
GAF	German Air Force
GCMH	Gerald Champion Memorial Hospital
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
HABS/HAER	Historic American Building Survey/Historic American Engineering Record
HAFB	Holloman Air Force Base
HAP	hazardous air pollutants
HAccP	High Accident Potential
HAWK	Homing All the Way to Kill
IDS	Interdictor Strike
IFR	instrument flight rule
IR	Instrument Route
IRP	Installation Restoration Program
JER	Jornada Experimental Range
kHz	kilohertz
kV	kilovolt
kVA	kilovolt-amperes
kWh	kilowatt-hour
LCTA	Long-Term Condition Trend Analysis
L_{dn}	Average Day-Night Equivalent Sound level
L_{dnmr}	Onset Rate Adjusted Monthly Day-Night Average Sound Level
LDT	Live Drop Target
Leq	Energy Equivalent Sound Level
Lmax	maximum sound level
LOS	level of service
LOSAT	Line-of-sight Anti-Tank
LTO	landing and takeoff
MAILS	Multiple Aircraft Instantaneous Line Source
mcf	thousand cubic feet
mgd	million gallons per day
mg/L	milligrams per liter
MLRS	Multiple Launch Rocket System

ACRONYMS AND ABBREVIATIONS (continued)

MLWA	Military Lands Withdrawal Act (1986) {Lands to Return to BLM in 2001}
MOA	Military Operations Area
MOU	Memorandum of Understanding
MRNMAP	MOA/Range NOISEMAP
MSA	metropolitan statistical area
MSL	mean sea level
MTR	Military Training Route
MVA	megavolt amperes
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLR	noise level reduction
NM	nautical miles
NMDGF	New Mexico Department of Game and Fish
NMSHTD	New Mexico State Highway and Transportation Department
NOI	Notice of Intent
NOT	Notice of Termination
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NTC	new target complex
NWR	National Wildlife Refuge
O_3	ozone
OCEDC	Otero County Economic Development Council
OSHA	Occupational Safety and Health Act
PAA	primary aircraft authorization
PAC	Protected Activity Center
PATRIOT	Phased-Array Tracking to Intercept of Target
Pb	lead
PHV	peak hour volume
PLUAC	Public Land Use Advisory Council
PM_{10}	particulate matter less than 10 microns in diameter
PNM	Public Service Company of New Mexico
ppm	parts per million
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
psi	pounds per square inch
PWS	Public Water Supply System
RAF	Royal Air Force
RBTI	Realistic Bomber Training Iniative
RCRA	Resource Conservation and Recovery Act
RDT&E	research, development, testing, and evaluation
RF	radio frequency
RGR	Rio Grande Rift

ACRONYMS AND ABBREVIATIONS (continued)

RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROC	region of comparison
ROI	region of influence
SCAQMD	South Coast Air Quality Management District
SEL	Sound Exposure Level
SHORAD	Short-Range Air Defense
SHPO	State Historic Preservation Office
SICBM	Small Intercontinental Ballistic Missile
SIP	State Implementation Plan
SM	statute miles
SO_2	sulfur dioxide
SO_x	sulfur oxides
SWPPP	Stormwater Pollution Prevention Plan
TDS	total dissolved solids
TDY	temporary duty
TF	terrain-following
TFR	terrain-following radar
TGO	touch-and-go
THAAD	Theater High-Altitude Air Defense
TNP	Texas-New Mexico Power Company
TNT	trinitrotoluene
T.O.	Technical Order
TOSS	Television Ordnance Scoring System
TOW	Tube-launched, Optically tracked, Wire Guided
TPWD	Texas Parks and Wildlife Department
TSP	total suspended particulates
TTE	Tactical Training Establishment
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance
V/C	volume-to-capacity ratio
VFR	visual flight rule
VLA	Very Large Array
VOC	volatile organic compound
vph	vehicles per hour
VR	Visual Route
WMA	Wildlife Management Area
WSA	Wilderness Study Area
WSMR	White Sands Missile Range
WSTF	White Sands Test Facility

CHAPTER 1.0

PURPOSE AND NEED

1.0 PURPOSE AND NEED

The United States Air Force (USAF) proposes[1] to beddown 30 additional German Air Force (GAF) Tornado aircraft, associated operations, and support personnel at Holloman Air Force Base (AFB), New Mexico (Figure 1-1). Section 1.1 provides information on the background for this proposal, while Sections 1.2 and 1.3 discuss the purpose and need for this action. Section 1.4 discusses environmental laws and regulations that would apply to the proposed action.

1.1 BACKGROUND

1.1.1 International Relations

Changes in international requirements and reductions in the military budgets of the United States have established a need to foster combined action capabilities for the military forces of many nations to work together to meet specific threats. These combined action capabilities permit substantial reductions in each nation's military force, while concurrently creating the larger force necessary to permit response to international requirements. This philosophy establishes a need for military personnel from different nations to achieve a uniformly high standard of training and proficiency, and to forge the strongest possible team. This policy is reflected in the current *U.S. National Military Strategy*, which emphasizes peacetime engagement by way of military-to-military contacts through international training and military exchanges. The results of these contacts help build mutual trust, effective communications, interoperability, and doctrinal familiarity.

Following the end of World War II, the United States government established a policy of providing training in specific areas to military personnel from countries allied to the United States, particularly from countries of the North Atlantic Treaty Organization (NATO). Such training has been conducted throughout the post-World War II era. The provision of such training has proven effective in maintaining combat readiness of allied forces, and ensuring that allied forces (that may one day need to fight as a team) can perform effectively in a multinational force structure. The success of the allied forces in Desert Storm is, at least in part, attributable to the close and effective working relationship fostered by such training experience.

Over the past 40 years, under the above policy, the U.S. Air Force has established an effective working relationship with the GAF. This relationship has included numerous joint interactions. Among these interactions, the GAF hosted U.S. Air Force personnel in their home country, thus demonstrating their

[1] The Notice of Intent for this Environmental Impact Statement was published May 8, 1996.

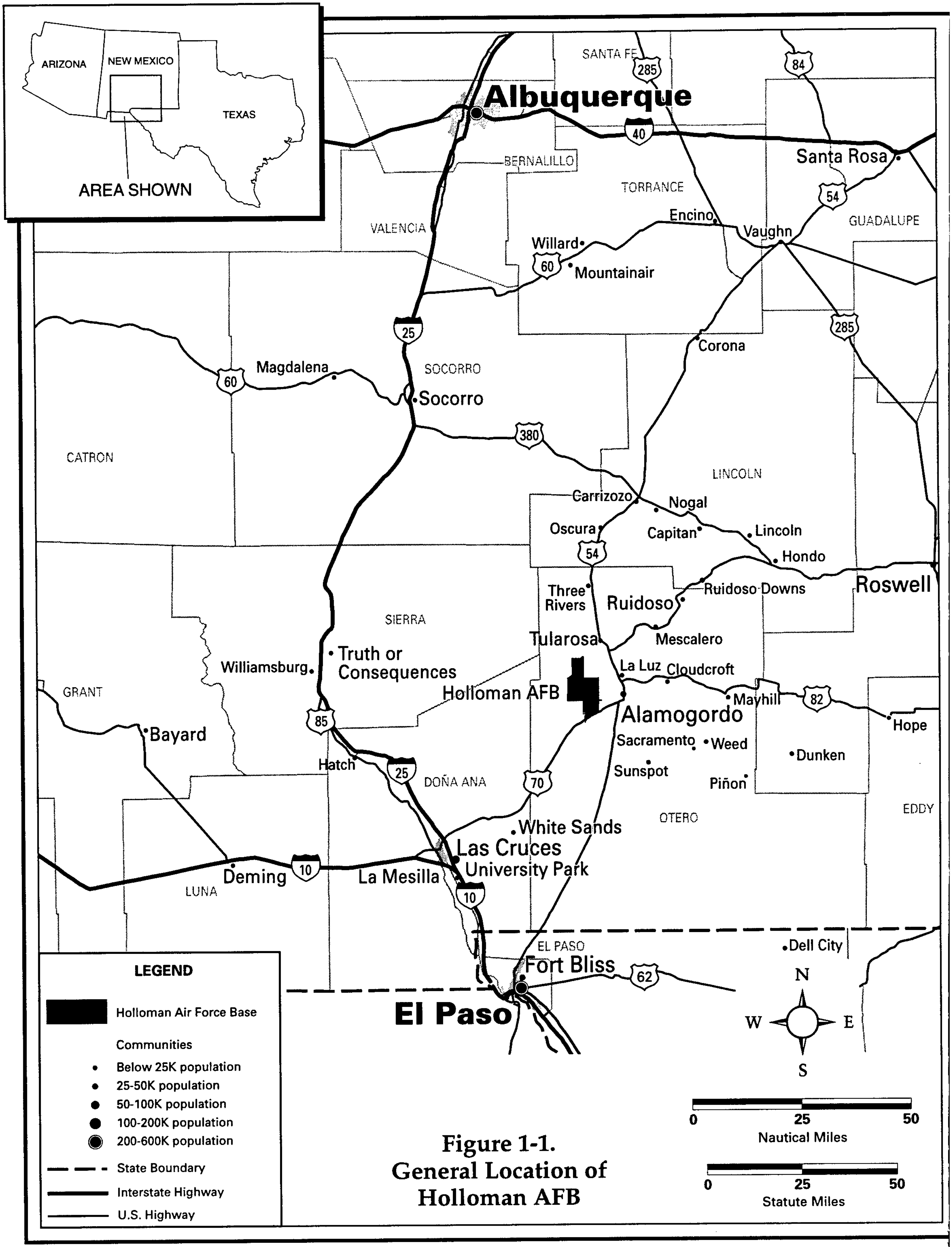


Figure 1-1.
General Location of Holloman AFB

commitment to a strong NATO, while the U.S. hosted GAF pilots at U.S. locations, thereby ensuring that allied aircrews were trained to the same high standards as U.S. pilots. Specific training programs for the German aircrews at U.S. locations include:

- Transition Training at Luke AFB, Arizona
  - F-84 aircraft (1957-1963)
  - F-104 aircraft (1964-1983)
- Euro-NATO Joint Jet Pilot Training at Sheppard AFB, Texas (1967 to date)
- F-4 Training at George AFB, California (1972 to 1992)
- F-4 Training at Holloman AFB, New Mexico (1992 to date)
- Tornado Training at Holloman AFB, New Mexico (1996 to date)

As a result of this training, GAF aircrews have shown enhanced effectiveness in working with U.S. forces in multinational efforts such as the Bosnian Peacekeeping mission. During the early 1990s, a number of U.S. bases were closed under Congressional mandate associated with the Defense Base Closure and Realignment Commission, established under the 1991 Defense Base Closure and Realignment Act of 1990 (Public Law PL 101-510, Title XXIX, November 5, 1990). One of the bases selected for closure was George AFB. During the closure process, the F-4 training program for German aircrews was transferred to Holloman AFB. The environmental effects of this relocation were evaluated under the National Environmental Policy Act (NEPA)[1]. GAF F-4 aircrews began training at Holloman AFB in 1992.

1.1.2 German Air Force Operations

In the late 1980s, discussions began about locating an initial GAF Tornado training unit in the United States. U.S. policy throughout the Cold War had focused on maintaining a visible, long-term, military presence in Europe. The end of the Cold War resulted in the reduction of U.S. forces stationed in Europe. Locating a GAF Tornado training operation in the U.S. would allow the U.S. to maintain a close working relationship with a vital ally. In the fall of 1989, Brent Scowcroft (President George Bush's National Security Advisor) raised this concept with his German counterpart, Horst Teltschick. In August 1990, General Merrill McPeak, U.S. Air Force Chief of Staff, briefed the GAF Chief of Staff on the concept of establishing a GAF training operation in the U.S. In November 1990, President Bush made a formal proposal to German Chancellor Helmut Kohl to locate a GAF training unit in the U.S. In July 1992, Richard Cheney, U.S. Secretary of Defense, and Volker Rühe, the German Federal Minister of Defense, announced the plan to locate a GAF training unit at Holloman AFB, New Mexico. The U.S. proposal to locate the GAF training operation at Holloman AFB was based on several factors. First, collocation of the German Tornados and the German F-4 training program (recently moved

[1] Air Force, 1991. Environmental Assessment: *Beddown of the 37th Tactical Fighter Wing at Holloman AFB.*

from George AFB to Holloman AFB, and conducted by the U.S. Air Force 20th Fighter Squadron) would reduce German costs by allowing for economies of scale. Second, the proximity of a large German community at Fort Bliss, approximately 920 German military and dependents, would reduce the logistics support requirements. The Germans operate a shuttle between Germany and the U.S. that flies into and out of El Paso, Texas. This shuttle is used for personnel and supplies from Germany. Third, Holloman AFB provides cross-training opportunities with German missile training units located at nearby Fort Bliss in El Paso. Fourth, Holloman AFB had the apparent capacity and the Military Training Routes (MTRs), Military Operations Areas (MOAs), and ranges to provide the requested training. Fifth, the German Command Element is located in El Paso, which keeps the German training unit close to the headquarters. All these factors directly contributed to the decision to locate the GAF Tactical Training Establishment (TTE) at Holloman AFB.

A Memorandum of Agreement (see Appendix A) establishing the GAF TTE at Holloman AFB was signed in May 1994. This eventually led to the relocation of 12 Tornado aircraft to Holloman AFB in May 1996. The potential environmental effects of that action were assessed under NEPA and U.S. Air Force Regulations (AFR)[1].

The current *U.S. National Military Strategy* emphasizes military-to-military contacts as part of the peacetime engagement component of U.S. strategy. The drawdown of U.S. forces in Europe and Germany continues to reduce the daily contact U.S. services have had for the past 50 years. This proposed beddown further strengthens the daily contacts between the two nations, thereby directly contributing to the U.S. National Military Strategy. Not only does the U.S. continue to have a strategic interest in Europe and NATO, but political and financial realities have increased the importance of coalition warfare. Therefore, our contacts with Germany, as a key ally in NATO and Europe, have been raised in importance. As a major financial and military power in Europe, the Germans are taking on more responsibilities outside their own country, making Germany a key coalition partner in future multinational operations. For example, the Germans have contributed 3,000 soldiers to NATO's Stabilization Force in Bosnia as well as flying in support of JOINT ENDEAVOR. The training that the Germans would receive from the proposed beddown would make Germany a more capable partner, which translates into committing fewer U.S. troops to meet future contingencies throughout the world.

The examples of JOINT ENDEAVOR in Bosnia and DESERT STORM in the Persian Gulf demonstrate that quality training permits substantial improvement in coalition operational capabilities and in aircrew responses to threats. The large number of currently unstable nations makes it essential for the United States to be able to rely upon well-trained allies. Quality training can only be achieved through a

[1] Air Force, 1993. *Proposed Beddown of the German Air Force PA-200 and an Additional AT-38 Training Unit at Holloman Air Force Base, New Mexico.*

realistic training environment. The deployment of the 12 Tornado aircraft to Holloman AFB has proven highly satisfactory to both the U.S. and German Air Forces. The beddown of 30 additional Tornados at Holloman AFB would build on this initial success and is seen as in the best interest of the United States and German Air Forces in enhancing the realism and quality of training.

In 1995, two years after the beddown decision on the original 12 Tornados, discussions were held between the two countries about the potential expansion of GAF Tornado training in the United States. Because of the need to optimize use of previous infrastructure investments (e.g., maintenance facilities and aircraft hangars), Holloman AFB was considered to be the only feasible location for the Tornado beddown. On this basis, the U.S. Air Force is considering a proposed action under which the GAF TTE for GAF Tornado aircrews would be expanded at Holloman AFB.

1.1.3 Airspace Realignment and Modifications

After the relocation of the 12 GAF Tornado aircraft, the U.S. Air Force and Air Combat Command (ACC) proposed to modify and realign airspace to support U.S. Air Force and GAF units then located at Holloman AFB and a variety of other Department of Defense (DOD) units. The ACC proposed that realignment and modification was needed both to meet expanded training requirements for both countries and compensate for increasingly limited access to White Sands Missile Range (WSMR) restricted airspace. The ACC proposal consolidated MTRs originally used to test Air Launched Cruise Missiles (ALCMs), established an aerial refueling anchor, and divided and modified the existing Talon MOA. The proposal was analyzed in the *Environmental Assessment of Proposed Airspace Modifications to Support Units at Holloman Air Force Base, New Mexico* (U.S. Air Force, 1997a). The Finding of No Significant Impact (FONSI) was signed in June 1997. The Environmental Assessment (EA) and FONSI are referred to in this Environmental Impact Statement (EIS) as the "ALCM/Talon EA". That modification and realignment of airspace is considered in the determination of baseline conditions in this EIS. Since formal approval by the Federal Aviation Administration (FAA) of the ALCM/Talon is pending, this EIS includes analysis of the proposed action both with and without these modifications.

1.2 PURPOSE

In the international arena, the purpose of the action is to further support a bilateral agreement between the governments of the United States and Germany. This agreement was first proposed by President Bush to German Chancellor Kohl in November 1990. The Memorandum of Agreement was signed May 1994, and implemented in 1996 with the location of 12 Tornado aircraft at Holloman AFB. Additionally, this proposal also demonstrates continued U.S. commitment to NATO allies, which is crucial as the U.S. military presence is reduced in Europe.

The implementation of this action for the GAF capitalizes on the substantial infrastructure investments the GAF has already made at Holloman AFB and provides a desert/mountainous terrain training location not otherwise available to GAF aircrews in Germany. Collocating the initial, continuation, and advanced training programs at one location would allow Tornado expertise to be shared among students in different courses which would enhance the training environment and produce better-trained students.

1.3 NEED

Implementation of this proposal would address the following needs:

- Protect U.S./German post-Cold War bilateral relations from possible degradation as a result of U.S. military force reductions in Europe. The two governments have agreements to conduct GAF military training in the U.S. as a method of maintaining cooperation between our countries and interoperability among our military forces. The proposed action promotes these agreements and demonstrates U.S. resolve to support internationally cooperative defense initiatives.

- Provide GAF a consolidated Tornado training establishment capable of supporting the addition of the basic syllabus, instructor syllabus, as well as the existing Tornado Fighter Weapons School syllabus, Advanced Tactics Course Syllabus, continuation training requirements, and desert/mountainous terrain training.

- Improve logistics efficiency and permit economy of scale for the GAF by collocating these additional aircraft with existing GAF operations at Holloman AFB.

1.4 STATUTORY COMPLIANCE

This EIS has been prepared to satisfy NEPA requirements (PL 91-190, 42 United States Code 4321 et seq.) as amended in 1975 by PL 94-52 and PL 94-83. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. In addition, this document was prepared in accordance with Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*), which implements Section 102(2) of NEPA and regulations established by the Council of Environmental Quality (CEQ) (40 Code of Federal regulations [CFR] 1500-1508). Other Federal statutes that may apply to the proposed action are listed in Table 1.4-1.

Table 1.4-1. Other Major Federal Environmental Statutes and Executive Orders Applicable to Federal Projects

Environmental Parameter	Statutes
Air	Clean Air Act (CAA) of 1970, as amended
Noise	Noise Control Act of 1972 and Amendments
Water	Federal Water Pollution Control Act (FWPCA) of 1972 and Amendments: Clean Water Act (CWA) of 1977 (commonly referred to as "the Clean Water Act as amended") and Water Quality Act (WQA) of 1987 Safe Drinking Water Act (SDWA) of 1972 and Amendments
Land	Federal Land Policy and Management Act (FLPMA) of 1976 Public Rangelands Improvement Act of 1978 Wilderness Act of 1964 National Forest Management Act (NFMA) of 1976 Farmland Protection Policy Act of 1981
Environmental Justice	Executive Order 12898 , Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations - 1994
Biological Resources	Migratory Bird Treaty Act of 1918 Bald and Golden Eagle Protection Act of 1940 Sikes Act of 1960, 1974, 1982, and 1986 Endangered Species Act (ESA) of 1973 and Amendments Fish and Wildlife Conservation Act of 1980 Lacey Act Amendments of 1981 Federal Insecticide, Fungicide and Rodenticide Act of 1947 Federal Noxious Weed Act of 1974 Executive Order 11987, Exotic Organisms - 1977
Wetlands and Floodplains	Section 404 of FWPCA of 1972 Executive Order 11988, Floodplain Management-1977 Executive Order 11990, Protection of Wetlands-1977 Emergency Wetlands Resources Act (EWRA) of 1986 North American Wetlands Conservation Act of 1989 Fish and Wildlife Coordination Act of 1934 and Amendments
Cultural Resources	National Historic Preservation Act (NHPA) of 1966 and Amendments Executive Order 11593, Protection and Enhancement of the Cultural Environment - 1971 Executive Order 13007, Indian Sacred Sites - 1996 Archaeological and Historic Preservation Act (AHPA) of 1974 American Indian Religious Freedom Act (AIRFA) of 1978 Archaeological Resources Protection Act (ARPA) of 1979 Native American Graves Protection and Repatriation Act (NAGPRA) of 1990
Solid/Hazardous Wastes	Resource Conservation and Recovery Act (RCRA) of 1976 as amended Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980

CHAPTER 2.0

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The U.S. Air Force is considering a proposed action (Section 2.1) to beddown 30 additional Tornado aircraft at Holloman AFB. In addition, the No-Action alternative is being considered (Section 2.2). Section 2.3 presents information on other past, present, and reasonably foreseeable future actions which could result in cumulative impacts when taken into consideration with the proposed action. Section 2.4 provides a comparison of impacts that would result from the implementation of the proposed action and the No-Action alternative. Section 2.5 summarizes permit and consultation actions that might be required if the proposed action were implemented.

2.1 PROPOSED ACTION

The U.S. Air Force proposes to beddown 30 GAF Tornado aircraft and associated operations and support personnel at Holloman AFB, New Mexico. The GAF would use these resources to conduct a basic conversion training course and an instructor course in addition to existing training. The new courses would take up to 28 weeks and would cycle approximately 80 students per year through the school. GAF personnel permanently assigned to Holloman AFB would include instructors, technicians, administrative personnel, and other support functions.

2.1.1 Aircraft and Aircraft Operations

As of the third quarter of fiscal year 1996 (FY96/3), the aircraft inventory at Holloman AFB included 101 aircraft including 46 F-117, 33 T/AT-38, and 24[1] F-4 aircraft, plus six HH-60 helicopters. Between FY96/3 and FY97/2, in independent actions, 12 Tornado aircraft (U.S. Air Force, 1993) were added to the Holloman inventory, while 21 AT-38 aircraft (U.S. Air Force, 1997a) were deleted from the inventory. In addition, QF-4 drone aircraft are also flown from Holloman AFB; the number of these aircraft present at any given time is variable. Appendix B provides additional information on existing inventory aircraft. Under this proposed action, an additional 30 Tornado aircraft would be added to the Holloman inventory by FY00.

Implementation of the proposed action would result in a change in operations within the Holloman aerodrome. Table 2.1-1 presents data on airspace operations at Holloman AFB for FY95, and projections for baseline conditions that would prevail in FY00, and under the proposed action. The FY95 data represents the most current

[1] The F-4 aircraft are part of the existing GAF inventory at Holloman AFB. U.S. Air Force and GAF inventory approaches differ slightly. The U.S. Air Force distinguishes between Primary Aircraft Authorizations (PAAs) and Backup Aircraft Inventory (BAI); the GAF does not draw this distinction. The data on aircraft provided in this section are primarily PAA. The F-4s, however, are part of the GAF inventory. By U.S. Air Force procedures, these aircraft would be listed as 18 PAA and six BAI.

Table 2.1-1. Annual Sorties and Multiple Patterns at Holloman AFB

Aircraft	FY95 Conditions				Projected FY00 Baseline				FY00 Baseline + Proposed Action			
	Sorties		Multiple Pattern*		Sorties		Multiple Pattern*		Sorties		Multiple Pattern*	
Type	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-117	4,441	2,745	7,550	4,667	4,441	2,745	7,550	4,667	4,441	2,745	7,550	4,667
F-4	3,350	60	9,000	0	3,350	60	9,000	0	3,350	60	9,000	0
Tornado	0	0	0	0	2,400	100	4,100	200	6,537	239	15,131	319
T-38	1,288	0	2,540	0	1,288	0	2,540	0	1,288	0	2,540	0
AT-38	4,800	0	9,460	0	0	0	0	0	0	0	0	0
HH-60	200	220	0	0	200	220	0	0	200	220	0	0
Total	**14,079**	**3,025**	**28,550**	**4,667**	**11,679**	**3,125**	**23,190**	**4,867**	**15,816**	**3,264**	**34,221**	**4,986**

*The HH-60 does not perform a multiple pattern operation.
Most of the remaining aircraft conduct "touch-and-go" multiple pattern operations within the aerodrome.
The exception to this is the F-117, which carries out a type of multiple pattern known as a "low approach".

Day = 7:00 am to 10:00 pm
Night = 10:00 pm to 7:00 am

data available at the time analysis for this action was begun. If approved, implementation of the proposed action would begin in June 1998 with the initiation of facilities construction. Airspace operations, however, would not be implemented until FY00. Various other actions would affect airspace operations at Holloman AFB (as well as in other airspace) prior to implementation of the proposed action. These actions were previously evaluated under NEPA and authorized for implementation. These changes are taken into account in the projected baseline for FY00. This baseline, which describes airspace operations that will exist at the time the proposed action would be implemented, is used as the basis of evaluating impacts of the proposed action. The analysis also considers the cumulative effect of the proposed action together with the effect of the other authorized actions which will occur in the area. These combined effects are presented in the cumulative effects analysis.

Under the proposed action, Tornado aircraft would primarily fly at subsonic speeds. However, after certain types of maintenance, test flights that include supersonic operations are required. To accommodate this requirement, approximately 24 annual sorties would involve supersonic flight, at altitudes of 10,000 feet above mean sea level (MSL) or higher. All supersonic flight under the proposed action would be confined to the existing WSMR supersonic airspace (Figure 2.1-1).

2.1.2 Personnel

There were 5,900[1] assigned personnel at Holloman AFB as of FY96/3[2]. This included approximately 4,780 ACC personnel, 770 tenant personnel under other U.S._Air Force commands, and 310 assigned plus 40 TDY personnel of the GAF. The withdrawal of the AT-38 aircraft from Holloman AFB in FY97, expected changes associated with overall U.S. Air Force manpower reductions, plus an expected change in tenant personnel will reduce base personnel by about four percent (from 5,900 to 5,640 personnel by FY00). Other future actions, as indicated in Section 2.3, may affect base population. These changes are addressed in the cumulative impact analysis. Under this proposed action, an additional 640 GAF personnel (600 permanent and 40 full-time equivalent TDY) would be brought to the base. Table 2.1-2 shows changes in personnel that would be required at Holloman AFB in order to support this proposed action.

2.1.3 Construction

Implementation of this proposed action would require construction activities at Holloman AFB and at the existing Red Rio target complex on WSMR. Construction requirements at these locations are discussed in the following subsections, and

[1] Assigned personnel numbers vary slightly from day to day; the data provided are approximations rounded to the nearest multiple of 10.

[2] At the time the analysis was begun, personnel data for FY96/3 were the most current available data. Thus, although FY95 was used in the analysis as the reference year for airspace operations, FY96 was used as the reference year for personnel.

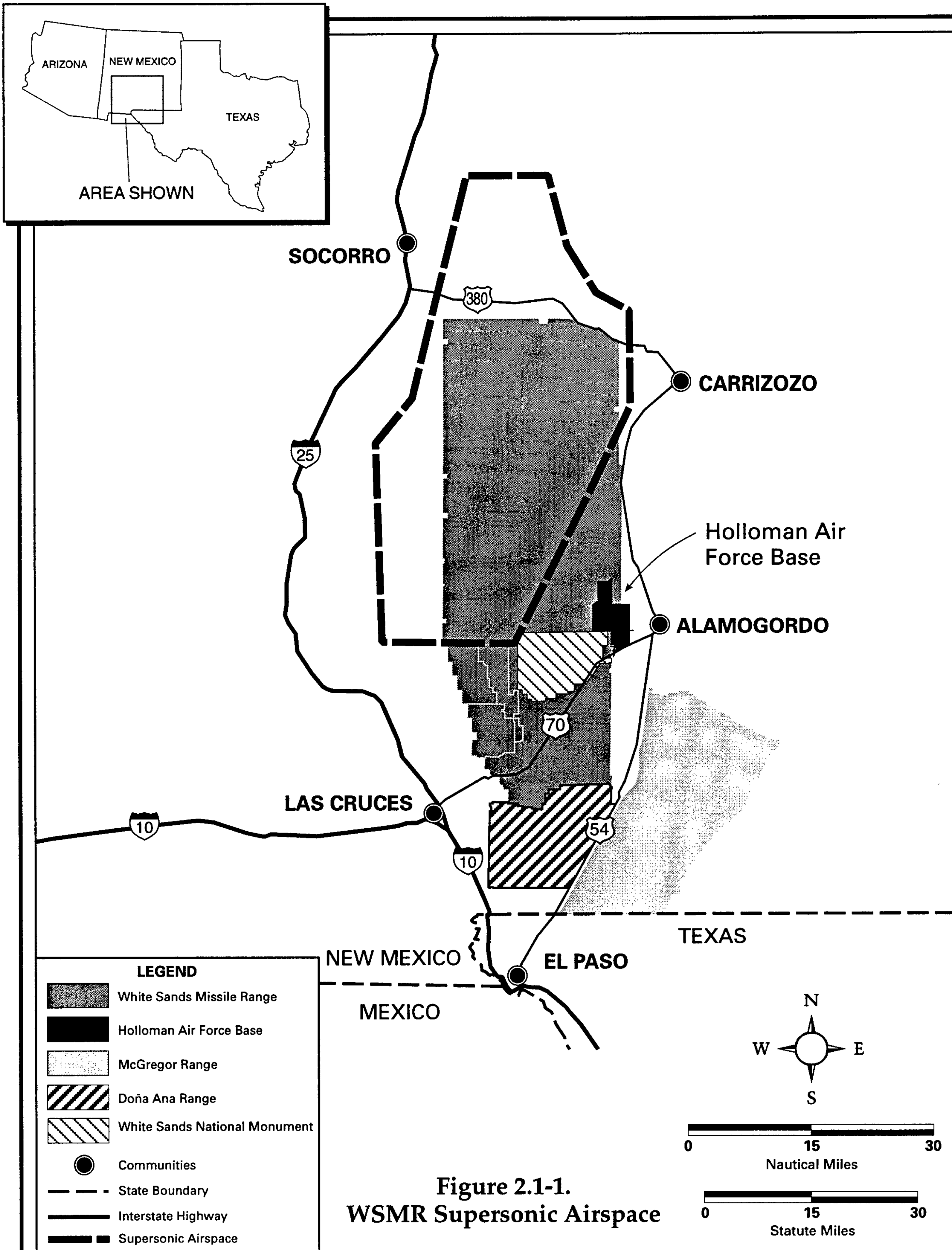


Figure 2.1-1.
WSMR Supersonic Airspace

Table 2.1-2. Changes in Manpower at Holloman AFB Due to the Proposed Action

Component	Existing Conditions (FY96)				All Known Changes to Existing Conditions†				Projected Baseline FY00				Delta Due to the Proposed Action				Projected Baseline (FY00) + Proposed Action			
Organization	Off.	Enl.	Civ.	Total	Off.	Enl.	Civ.	Total	Off.	Enl.	Civ.	Total	Off.	Enl.	Civ.	Total	Off.	Enl.	Civ.	Total
ACC	400	3,700	680	4,780	-40	20	-20	-40	360	3,720	660	4,740	0	0	0	0	360	3,720	660	4,740
Air Force TDY*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tenants	110	400	260	770	-30	-170	-20	-220	80	230	240	550	0	0	0	0	80	230	240	550
ACC+Tenants+TDY	510	4,100	940	5,550	-70	-150	-40	-260	440	3,950	900	5,290	0	0	0	0	440	3,950	900	5,290
GAF	30	270	10	310	0	0	0	0	30	270	10	310	60	440	100	600	90	710	110	910
GAF TDY**	40	0	0	40	0	0	0	0	40	0	0	40	40	0	0	40	80	0	0	80
GAF Total	70	270	10	350	0	0	0	0	70	270	10	350	100	440	100	640	170	710	110	990
Grand Total	580	4,370	950	5,900	-70	-150	-40	-260	510	4,220	910	5,640	100	440	100	640	610	4,660	1,010	6,280

*Temporary Duty Status. At any given time, a small portion of Holloman AFB personnel are posted to other locations on TDY status.
However, at any given time, a small portion of the personnel are TDY posted to Holloman AFB from other locations.
Records are not kept of cumulative TDY postings. It is assumed that, at on an annual basis, there is no net gain or loss of Air Force personnel at Holloman AFB due to TDY postings.

†Associated with known or anticipated changes in tenant use plus anticipated changes in manpower authorizations.

** An increase of 80 students would be processed through the Tactical Training Establishment (TTE) each year under the proposed action. As an annual average, this is equivalent to 40 full-time personnel.

summarized in Table 2.1-3. For purposes of impact assessment, construction costs for this proposed action are estimated at approximately $100 million. These costs do not include the costs of a new target complex (NTC); these costs are location-specific and are discussed in Section 4.9, Socioeconomics. With selection of the proposed action, construction is proposed to begin in June 1998, and would be completed by August 2000.

Holloman AFB. Figures 2.1-2 and 2.1-3 identify proposed facilities to be constructed at Holloman AFB. Total on-base construction would affect about 96 acres. Proposed construction activities would be primarily confined to the cantonment area as shown. The only exception to this would be the proposed construction of additional munitions storage facilities, affecting approximately 15 acres immediately north of the cantonment (Figure 2.1-4). This 15-acre area is relatively undisturbed, and contains an archaeological site and several burrowing owl nests. Under the proposed action, existing water, sewage, and electrical utilities would be upgraded. This would involve short-term and temporary earth disturbance, but all of the affected areas would be disturbed by other construction activities. No additional area would be disturbed during utility upgrade activities. Construction at Holloman AFB would require an estimated 400,000 cubic yards of gravel and 300,000 cubic yards of sand.

City of Alamogordo. A German school is operating in cooperation (co-use) with one of the Alamogordo elementary schools. This school, using a German-based curriculum, is intended to meet the needs of the children of GAF personnel assigned to Holloman AFB. About 40 students are currently attending the German school; the number of students is expected to increase to as many as 100 using four classrooms in the future. It is anticipated that implementation of this action would increase the population of the German school up to 230 students. This growth, together with increasing U.S. student population in Alamogordo public schools, would require the construction or leasing of a new school building to serve the needs of the German students. At this time, plans to implement a German school are under the decision of the German government.

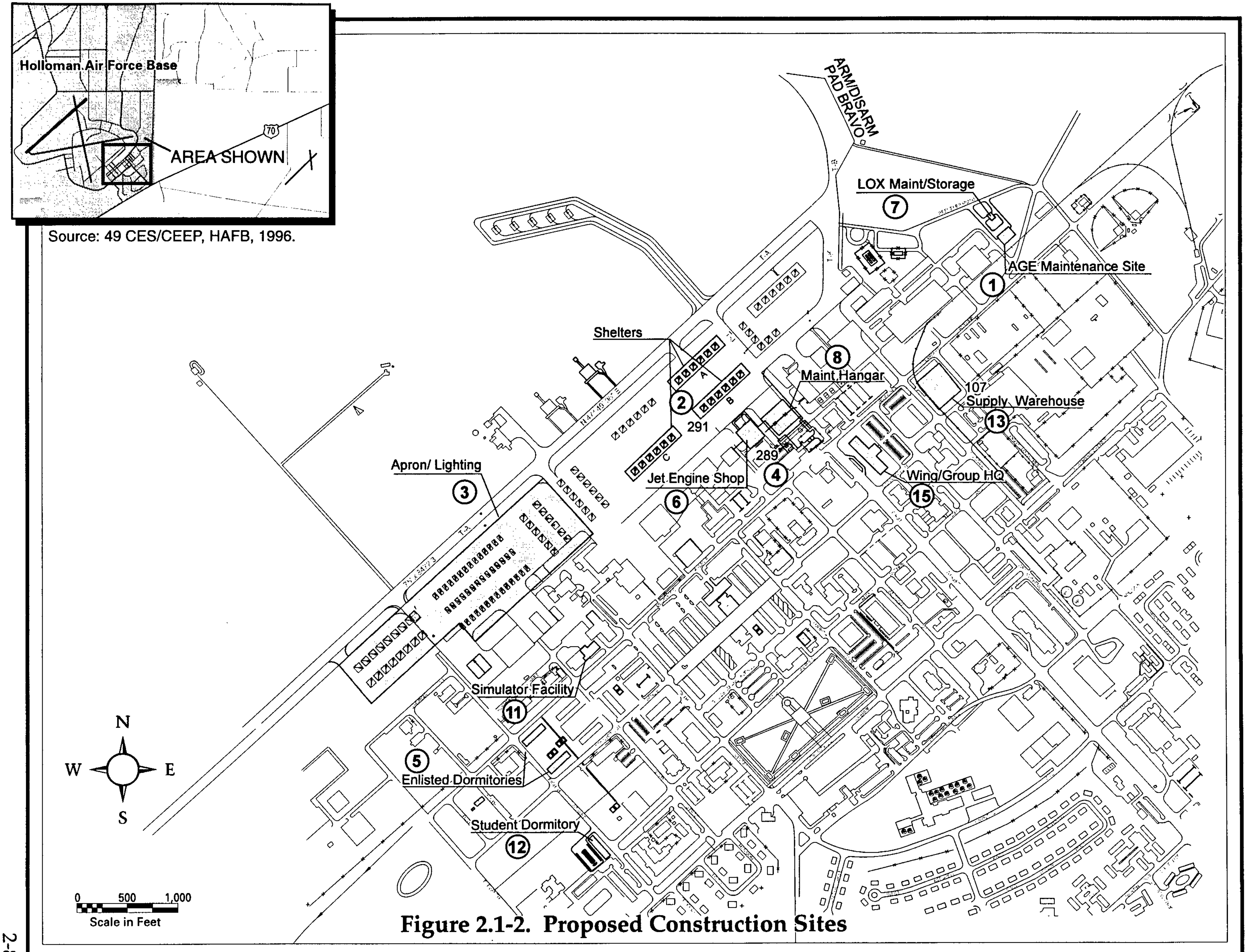
White Sands Missile Range. Television Ordnance Scoring System (TOSS) components would be installed adjacent to the existing target arrays in the Red Rio and Oscura Impact Areas. At Oscura, this equipment would be tied into existing fiber-optic cable to support data transmission to the TOSS center at Holloman AFB. At Red Rio, the U.S. Air Force would install the required TOSS equipment, solar panels, batteries, and a 1.5-mile subsurface fiber-optic cable between the components to support data transmission. In addition, a 3.5-mile subsurface fiber-optic cable would be installed to connect the TOSS components to the existing fiber-optic data network. The total area disturbed by construction is estimated at less than 10 acres.

For the most part, these changes would be proportionate to the changes in personnel or, where appropriate, the number of aircraft. Day-to-day maintenance of the Tornado aircraft, including minor painting, would be conducted at Holloman AFB. However, major engine overhauls and painting would take place in Germany. The

Table 2.1-3. Base Construction Requirements to Support the Proposed Beddown

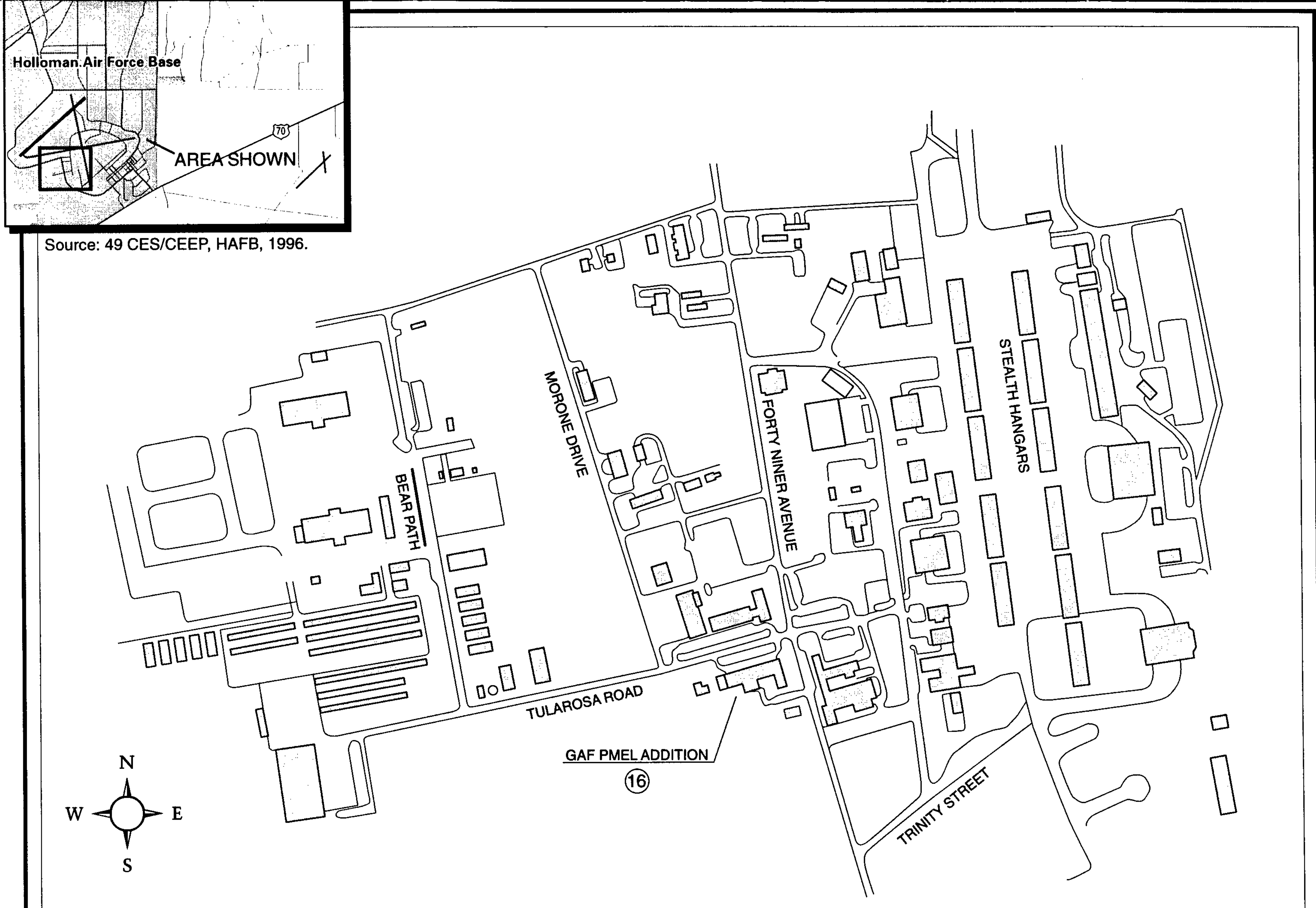
Item*	Requirement	Scope		
		Building Footprint (Sq. Ft.)	Disturbed Area (Acres)	Other
1	AGE Maintenance & Yard	14,639	1.0	
2	Aircraft Parking Shelters	149,027	18.0	
3	Apron/Lighting	1,259,388	40.0	
4	Demolish Buildings	53,839	1.2	
5	Enlisted Dorms	60,192	2.4	140-person
6	Jet Engine Shop	17,804	1.7	
7	LOX Maintenance/Storage	764	1.0	
8	Maintenance Hangar	75,100	3.5	6 Bays
9	Munitions Storage	5,820	1.0	two 26'X60' modules, inert storage pad
10	Munitions Maintenance	17,456	15.0	GAF trailer storage GAF inert storage GAF bomb buildup facility GAF Admin. bldg.
11	Simulator Facility	7,535	1.0	
12	Student Dorm	30,096	2.3	70-person
13	Supply Warehouse	58,125	2.6	
14	Utilities	NA	1.0	
15	Wing/Group HQ	76,058	3.9	
16	PMEL Bldg 389	2,852	0.5	
Overall		**1,824,195**	**96.1**	

*See Figures 2.1-2, 2.1-3, and 2.1-4.
NA: Not Applicable



Source: 49 CES/CEEP, HAFB, 1996.

Figure 2.1-2. Proposed Construction Sites



Source: 49 CES/CEEP, HAFB, 1996.

**Figure 2.1-3.
Proposed PMEL Addition**

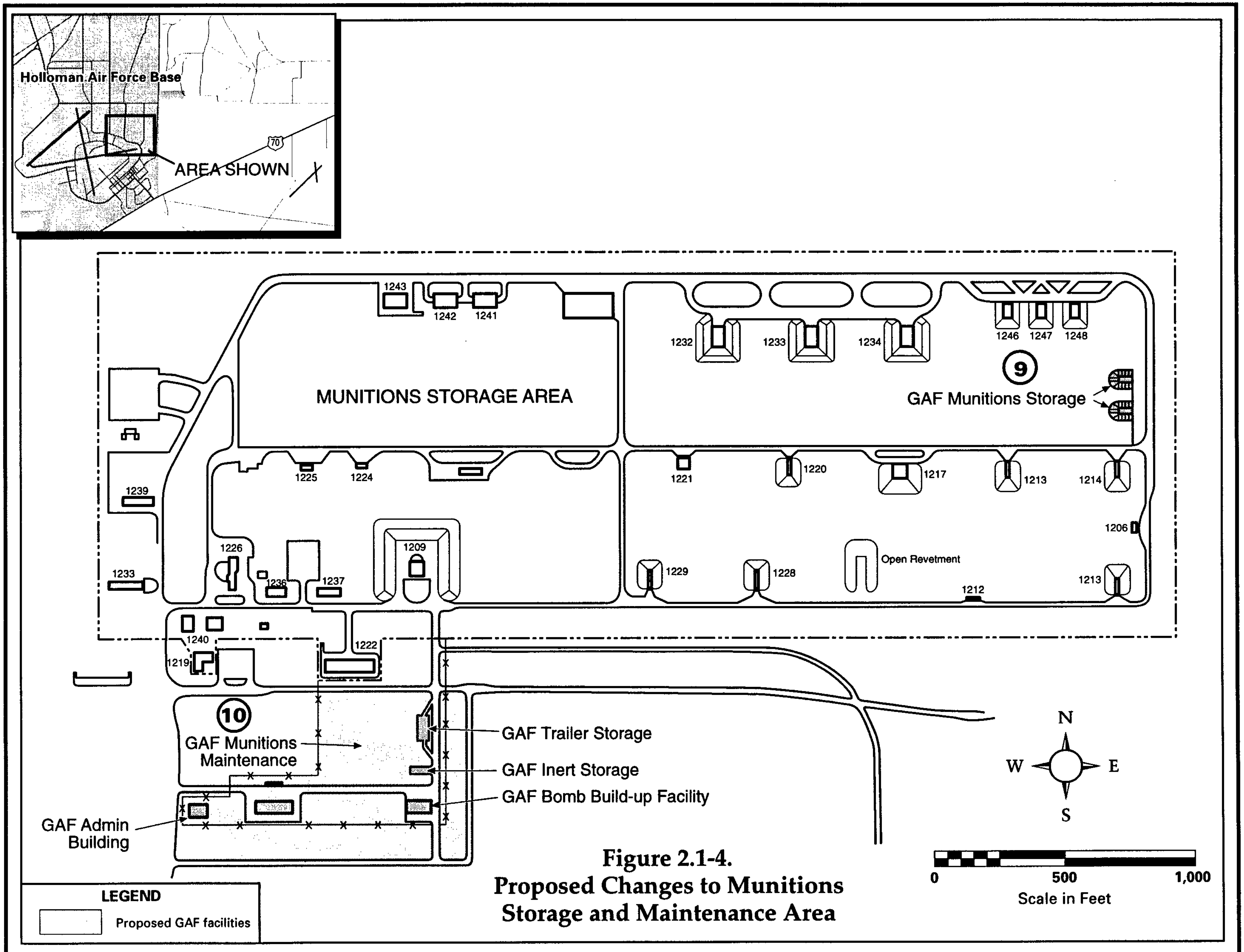


Figure 2.1-4.
Proposed Changes to Munitions Storage and Maintenance Area

base motor pool currently includes 638 general purpose vehicles, 262 special purpose vehicles, 65 base maintenance vehicles, and 101 material handling vehicles, for a total of 1,066 vehicles. Under the proposed action, 56 vehicles of various types, as shown in Table 2.1-4, would be added to the base motor pool.

2.1.4 Training Requirements

Meeting Tornado aircrew training needs is an integral part of the proposed action. As the Tornado is primarily an air-to-ground platform, the use of air-to-ground targets is part of the training syllabus. Three training options are being considered for training Tornado aircrews in the use of air-to-ground delivery of live and inert/subscale[1] munitions:

- Establishing an NTC on western Otero Mesa on McGregor Range (West Otero Mesa training option). This is the preferred option.

- Establishing an NTC in the Tularosa Basin portion of McGregor Range (Tularosa Basin training option).

- Using existing target areas for air-to-ground training (Existing Range training option).

These options were selected after consideration of the specific training requirements of the Tornado aircrews. These training requirements are described in Section 2.1.4.1. The specific locations considered for a proposed NTC were arrived at as a result of a detailed site selection analysis (Section 2.1.4.2). The NTC training options (West Otero Mesa and Tularosa Basin) share many features that are independent of the exact location of the NTC. Both NTC sites being considered, for example, share similar target types and layouts, and have virtually identical airspace requirements. These common NTC components are described in Section 2.1.4.3. Differences between the two options are detailed in Section 2.1.4.4. The Existing Range training option differs from the other options in that (1) the NTC would not be constructed, (2) use of existing ranges would increase, and (3) use of individual blocks of airspace would be different. Section 2.1.4.5 describes airspace requirements for the Existing Range training option.

2.1.4.1 Training Requirements for the Tornado Aircrews

The Tornado Interdictor Strike (IDS) is a two-seat, multi-role, land-based, all-weather supersonic long-range fighter bomber. It is manufactured by Panavia, a German-Italian-British company and flown by the armed forces of those countries. The aircraft's primary mission is high-speed, low-level attack with varying offensive and defensive capabilities. Mission capabilities include long-range conventional attack, close air support, defensive air-to-air, and others. The aircraft has an

[1] Sub-scale training ordnance may contain a small explosive spotting charge, used to mark where the unit impacts, permitting an observer to score the accuracy of the delivery.

Table 2.1-4. Proposed Additions to the Base Motor Pool

Vehicle Type	Additional Vehicles
Aircraft Tow Vehicle (Bobtail)	5
Bus (45-Passenger)	2
Bus (28-Passenger)	2
Forklift (3-Ton Diesel)	2
Forklift (3-Ton Electric)	1
Panel Van	13
Pickup (1/4-Ton, Extended Cab)	1
Pickup (2-Ton Open Cargo)	6
Pickup (4-Wheel Drive, 6-Passenger)	1
Pickup (6-Passenger)	7
Sedan	3
Station Wagon	8
Tow Truck (MB-4)	3
Truck (5-Ton)	2
Total	**56**

operational range of 350 nautical miles (NM) and can patrol for more than two hours without using its air refueling capability. It is equipped with a pilot-controlled wingsweep mechanism, two 27mm guns, and can carry two AIM-9 Sidewinder missiles for self-defense, along with an array of air-to-ground weapons.

A unique feature of the Tornado's equipment is its terrain-following radar (TFR) system. This system is used in combination with the fly-by-wire system and the autopilot. These features enable the aircraft to be flown automatically at low-level altitudes down to 200 feet above ground level (AGL) in adverse weather conditions, avoiding high terrain and other obstructions. It does this by looking ahead up to six NM at terrain features the aircraft will encounter. Flying at low altitudes increases the Tornado's survivability by avoiding detection by surface-to-air missiles and anti-aircraft artillery (AAA).

Depending on experience, the GAF students would be given various levels of progressive training while at Holloman AFB. Their courses would include classroom training in on-base facilities and practical training using various training aids as well as the aircraft. In the practical training, aircrews would start out with basic operations. These basic operations include elements such as takeoff and landing, and familiarization with the TFR. They would work up to more complex, multifaceted activities that replicate their combat missions. These more complex operations include elements such as takeoff followed by low-altitude transit to a target while avoiding simulated threats, target attack, and return to base. The training syllabi are directly related to the Tornados low-altitude air-to-ground mission. Training would include five main activities which are similar to training by U.S. aircrews:

- **Proficiency in operating the aircraft.** This would be performed at Holloman AFB, with particular emphasis on landing and takeoff (LTO) and touch-and-go (TGO) operations. TGOs are an efficient way for aircrews to practice repetitive takeoffs and landings in a single sortie.

- **Low-altitude navigation and TFR familiarization.** This training would be performed primarily on MTRs specifically established for such training. (MTRs are essentially aerial "highways" of varying lengths, widths, and altitudes that are used for low-altitude flight tactics and navigation.) The low-altitude navigation training simulates flying to a ground target at low altitude to avoid detection. The Tornado can be flown as low as 200 feet AGL with TFR, and as low as 100 feet AGL visually. During the training, aircrews would begin at higher altitudes (500 feet and above), working down to lower altitudes as the course progresses. On average, aircrews would spend about 10 percent of their low-altitude training on MTRs at altitudes between 500 and 1,000 feet. About 80 percent of their time would be spent between 300 and 500 feet, and 10 percent between 100 and 300 feet AGL. Part of this training involves becoming proficient in the use of the aircraft's instrumentation in order to be able to operate in all weather conditions.

- **Air-to-ground attacks on targets.** The primary mission of the Tornado is to attack ground targets. This aspect of the training would be performed at target complexes on DOD ranges. Most of the target training would involve subscale training ordnance, but some full-scale inert[1] and live drops would be practiced. All live ordnance training would be performed on the existing Live Drop Target (LDT) at the Red Rio Impact Area in WSMR. In a typical air-to-ground training mission, Tornado aircrews would travel to their target along MTRs at low altitude, as they would during combat missions. They would practice a variety of delivery profiles, including low- and high-altitude level drops, "pop-ups", and other maneuvers. Training requirements include both conventional targets and simulated "real world" targets, such as truck convoys. To take maximum advantage of each sortie, the aircrews would practice several delivery modes on each mission. During a typical sortie, this would involve eight to 10 passes on the targets. All air-to-ground actual deliveries would be performed in Restricted Areas. (Restricted Areas are blocks of airspace above and around areas where hazardous activities are conducted, such as a bombing range.)

- **Air intercept training.** Tornado aircrews need to develop proficiency in countering attacks by interceptor aircraft enroute to their targets. This activity is performed in various types of airspace, including Restricted Areas and MOAs. MOAs are blocks of airspace established to separate nonhazardous military flight training from other instrument flight rule (IFR) traffic. In a typical intercept mission, air-to-air combat aircraft would simulate the interceptor role, and the Tornado aircrews would perform evasive maneuvers to escape and defeat their attackers. This activity would be performed at both high (above 10,000 feet MSL) and low (300 to 1,000 feet AGL) altitude. No weapons would be fired during this activity, but self-protection flares and chaff would be used where permitted.

- **Training in aerial refueling.** Some Tornado sorties would include aerial refueling. Aerial refueling by tanker aircraft is performed in airspace specifically designated for aerial refueling activities. A total of 517 annual Tornado refueling operations are projected under the proposed action. Most of these would be conducted in the block from 12,000 to 18,000 feet MSL AR-X652[2] in west Texas. Up to one-fourth of these operations would be conducted in two higher-altitude refueling anchors (AR-602 and AR-644), where the lowest altitude of use is 19,000 feet MSL. Tornados would also practice buddy-buddy refueling during some of their MTR flights. Buddy-buddy refueling consists of one Tornado refueling another Tornado and is conducted at about 1,000 feet AGL.

2.1.4.2 Site Selection Process

The three training options are primarily distinguished from each other in terms of how they meet the need for air-to-ground weapons training. All three training options would meet at least minimal aircrew training requirements, but not all

[1] Full-scale inert ordnance is similar in shape and weight to live ordnance but is filled with concrete..

[2] "X" in AR-X652 denotes not yet approved by the FAA.

three training options would provide optimal training, particularly in meeting the need for air-to-ground weapons training. Such training is an integral part of the Tornado training syllabus. To a great extent, the selection of weapon ranges for training determines or conditions the use of other airspace. Holloman AFB aircrews currently use targets and target complexes on WSMR (Red Rio and Oscura target complexes) and McGregor Range (a single conventional target in the northwest corner of the range). They also make use of the target complex on Melrose Range. Current airspace operations at Red Rio and Oscura target areas are approaching the maximum use capacity of these resources. The additional 30 aircraft would increase the demand for Red Rio and Oscura above their maximum capacity. Physical limitations of some of the target complexes specifically restrict their utility for training Tornado aircrews. Terrain features of the Red Rio and Oscura target complexes preclude their use for training in certain types of munition deliveries.

The Air Force has considered changes in scheduling practices and increased use of Melrose Range to overcome these limitations. These changes could accommodate the increased training activity under the proposed action. However, even with changes in scheduling practices, much of the additional training requirement could only be met with increased use of Melrose Range. At a distance of 160 NM from Holloman AFB, Melrose Range is at the outer limits of the distance at which Tornado aircrews can accomplish effective training (180 NM). As a result, certain types of training could not be effectively accomplished at Melrose Range. As a result, even with changes in scheduling practices, and the increased use of Melrose Range, fewer training requirements would be accomplished in the absence of the creation of an NTC. Thus, aircrews completing their courses at Holloman AFB would require additional training sorties elsewhere.

Restricting training to existing ranges and target complexes would result in a training regime that meets minimally acceptable requirements, but overall would be of undesirable reduced quality. To overcome this limitation, the U.S. Air Force is considering establishing an NTC at a location within 180 NM of Holloman AFB. This complex would need to be sited such that it could better meet the training requirements of the Tornado aircrews.

A systematic site evaluation process was undertaken to identify and screen candidates for the proposed NTC. The process involved three steps: (1) developing site selection criteria, (2) Phase I Screening applying those criteria to screen areas around Holloman AFB and identify candidate locations, and (3) Phase II Screening reviewing the candidate locations to determine which meet the minimum requirements for an NTC. The following sections summarize the site selection process, identify the candidate sites that were considered, and briefly describe the candidates that were eliminated from detailed study.

The NTC would consist of an impact area, the surrounding area encompassed by the safety "footprint"[1] (safety area), and a larger airspace area necessary to contain aircraft operations while they deliver their ordnance. All must be contained within designated restricted airspace. Siting the NTC, therefore, involves accommodating the entire complex of interrelated land and airspace requirements. Specifically, these requirements include:

- An impact area able to accommodate a realistic target array. The nominal dimensions of this area are two miles by four miles, totaling eight square miles. The actual dimensions of the impact area may differ slightly but, in general, an eight-square-mile area is adequate to provide a realistic target scenario.

- A safety footprint surrounding the impact area where ground access can be controlled while the target complex is in use. The dimensions of this safety footprint are based on the types of munitions anticipated to be used, as well as the delivery profiles for those munitions. While the safety footprint varies from munition to munition, the largest dimension is a 27,000-foot radius surrounding the impact area.

- Restricted airspace that provides at least 90 degrees of attack axis, which requires 12 NM in front of the target impact area and five NM past the impact area in at least two directions. This translates to Restricted Area airspace that is a minimum of 19 by 21 NM. This airspace must be available from the surface to a minimum of 21,000 feet AGL.

- Access to the target area from at least one MTR that is a minimum of 160 NM long and accessible from Holloman AFB. This permits a minimum of 20 minutes of low-altitude training prior to delivering ordnance.

- Location of the NTC within the boundaries of the United States, in compliance with the agreement between the governments of the United States and Germany. Further, to meet the training requirements of the units at Holloman AFB, including the GAF, the complex must be available for use a minimum of 88 hours per month on average, or approximately four hours per workday.

Based on both U.S. Air Force and GAF training needs, the U.S. Air Force determined the requirements and performance criteria that the NTC would have to satisfy. These requirements and performance criteria provided the basis for site selection criteria used to determine the suitability of a geographic location for the NTC. The site selection criteria were applied in sequence to eliminate completely unsuitable areas, identify candidate locations, and assess the suitability of those locations for the NTC. This process was performed in two phases: in the first phase, selection criteria were used to identify the region of analysis and screen out unsuitable areas; in the second phase, areas that had not been screened out were examined more closely to

[1] Land areas defined for various munitions and delivery patterns within which there is a 95 percent confidence level that 99.9 percent of the delivered munitions will be contained.

determine whether they could accommodate the NTC in accordance with the site selection criteria.

Phase I Screening. The first phase of the screening process was performed by applying Geographic Information System (GIS) overlays to identify and exclude areas that did not meet the minimum selection criteria. Illustrations of these criteria are shown in Figures 2.1-5 through 2.1-10. Following is a summary of the criteria that were applied:

- Based on the fuel capacity of the Tornado aircraft, the NTC must be within 180 NM flight distance of Holloman AFB. This would allow GAF aircrews to perform the training regimes required by their syllabus and return to Holloman AFB with a safe level of fuel reserves without refueling. Initially, a 180 NM radius was drawn around Holloman AFB to define the geographic extent of the area to be screened, recognizing that some areas within the radius would actually be farther than 180 NM flight distance because of the specific route that would have to be flown.

- The Restricted Area of the NTC must be located outside existing public use airports, Class C and D airspace, and Federal Airways (below 18,000 feet MSL) and Jet Routes (above 18,000 feet MSL) used by civil and commercial aircraft.

- The land area associated with the NTC, including the impact area and the safety footprint, must be located outside developed areas such as towns and communities, national and state parks and recreation areas, wilderness areas, wildlife refuges and preserves, and Native American reservations.

- The NTC must be able to accommodate GAF training requirements, including Terrain Following (TF) patterns for both day and night missions and instrument meteorological conditions. The principal constraint is the terrain variation that can be tolerated within the aircraft flightpath and immediately surrounding the impact area; this is due to the Tornado's TFR. The TFR monitors terrain in the direction of flight and automatically engages terrain avoidance maneuvers when it registers hazardous terrain elevation changes. If this were to occur before the pilot delivered the munitions, that delivery would not be successful and the training would be lost. Terrain elevation cannot increase more than 1,000 feet for six NM past the target. Because each mission would involve multiple passes, elevation changes along the return path to the initial point of attack must also be limited to enable the aircraft to maintain a minimum speed of 400 knots calibrated airspeed without engaging the TFRs priority avoidance maneuvers.

- Targets in the NTC impact area must be visible from 10 NM prior to release while flying at an altitude of 200 feet AGL, in order to be able to clearly acquire the target on radar when the aircraft is lined up for weapons delivery. This requirement also limits acceptable terrain variation.

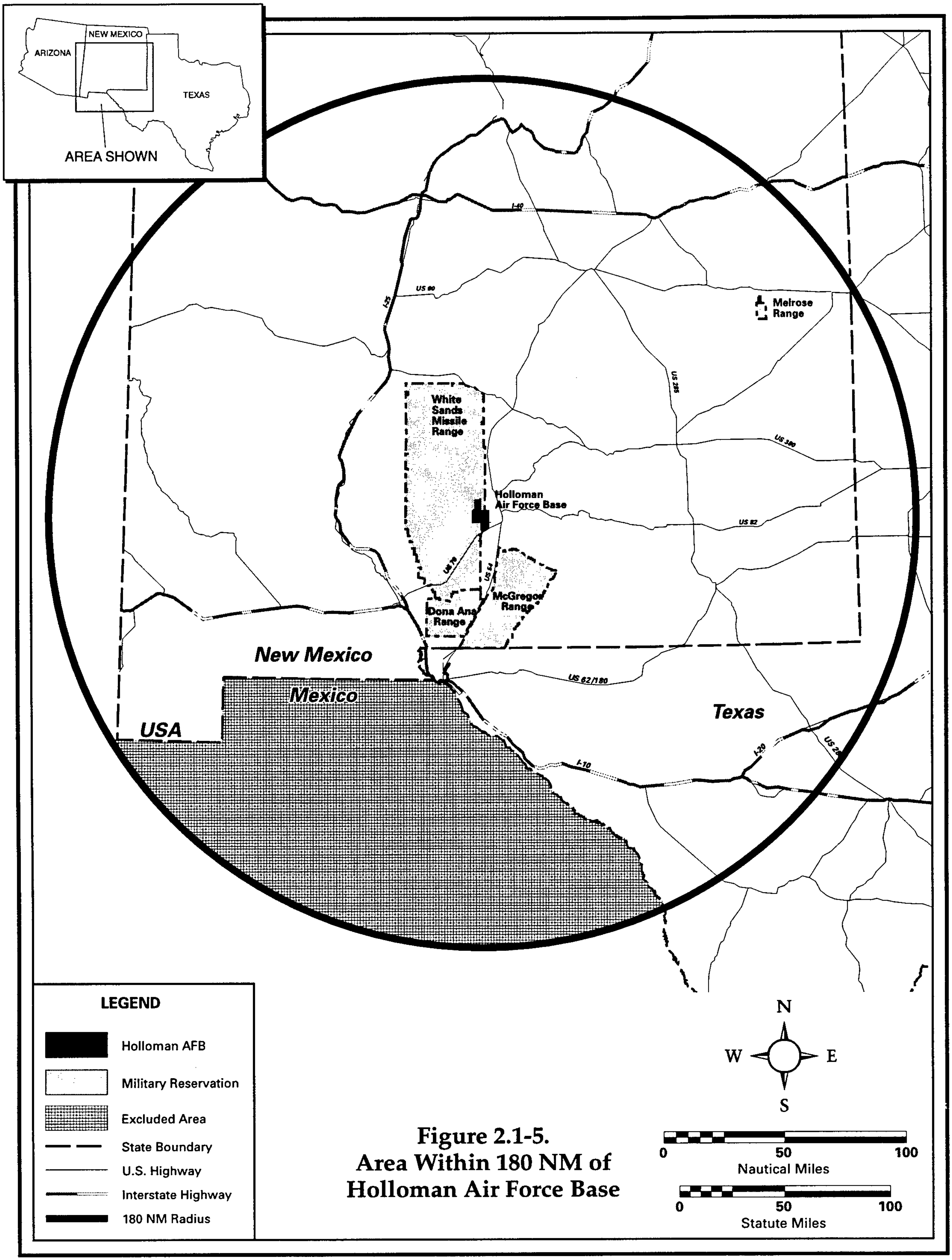


Figure 2.1-5.
Area Within 180 NM of Holloman Air Force Base

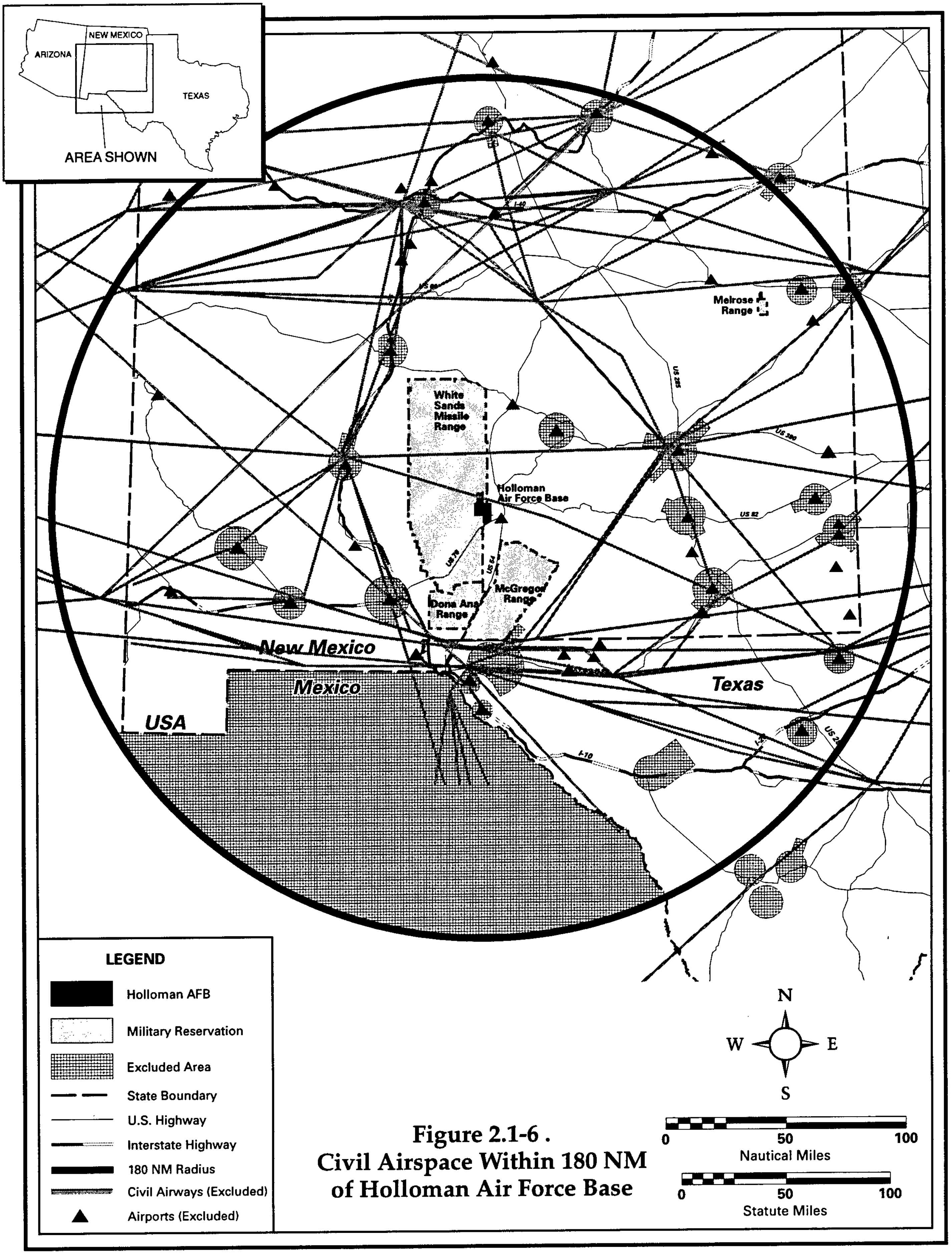


Figure 2.1-6 . Civil Airspace Within 180 NM of Holloman Air Force Base

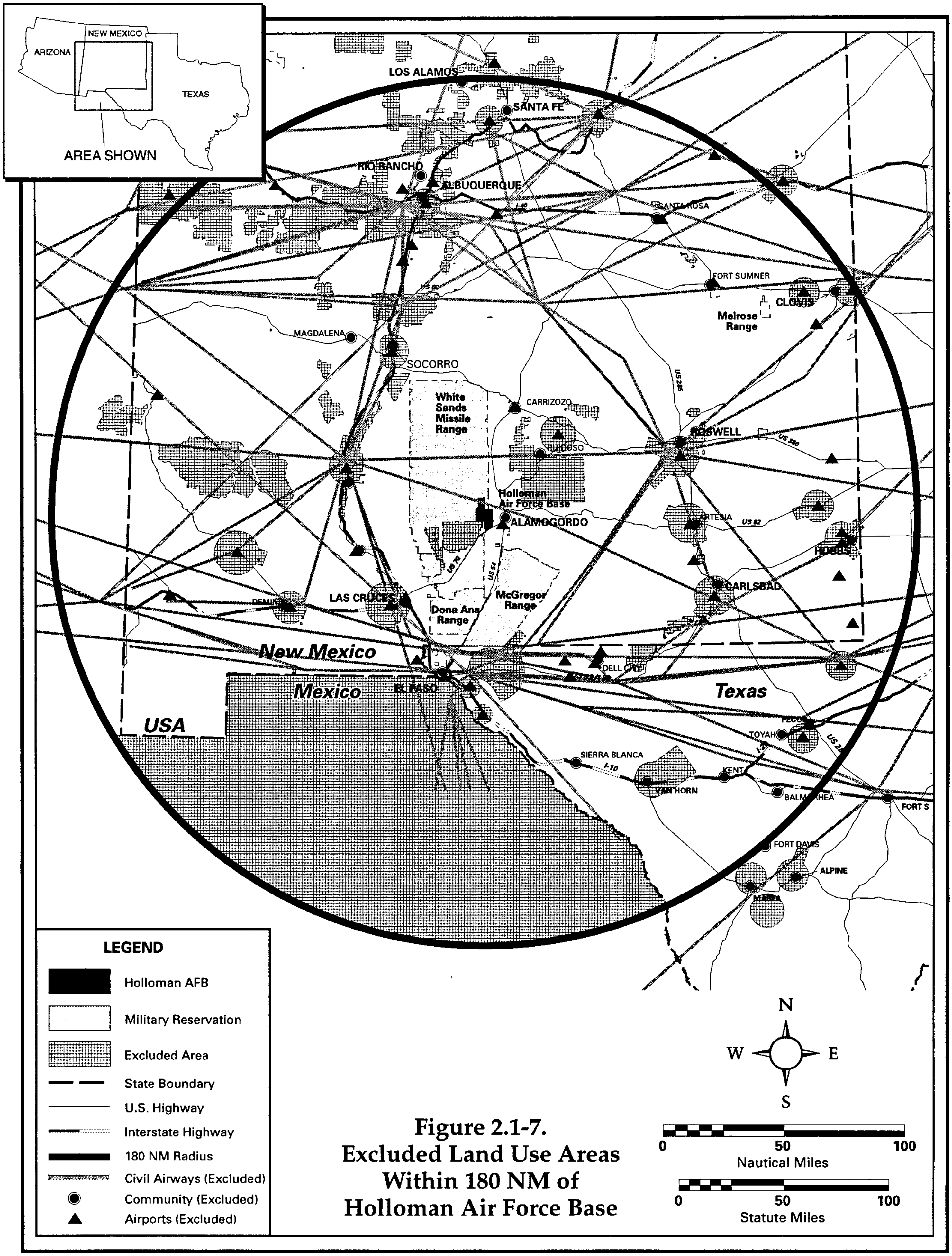


Figure 2.1-7. Excluded Land Use Areas Within 180 NM of Holloman Air Force Base

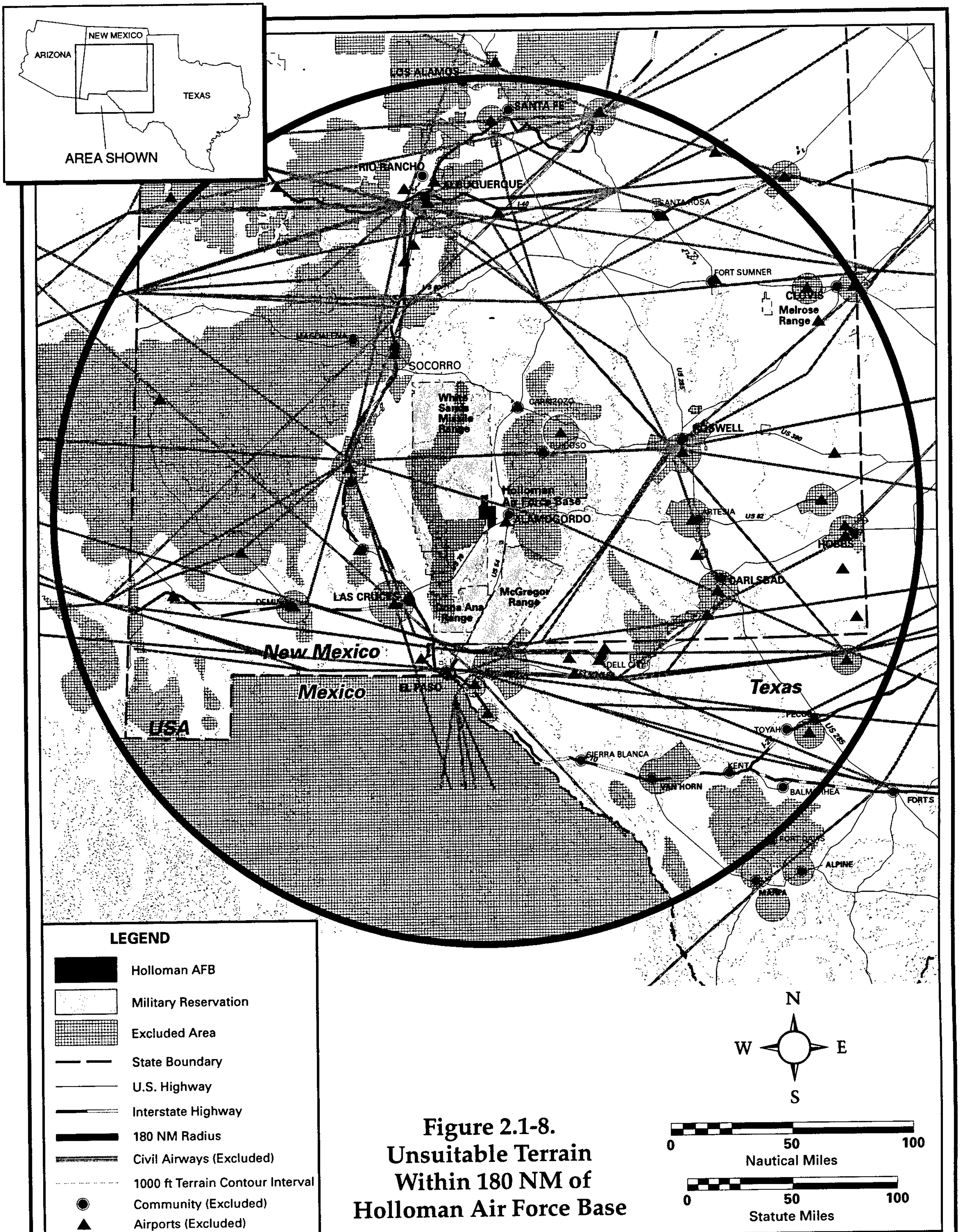


Figure 2.1-8. Unsuitable Terrain Within 180 NM of Holloman Air Force Base

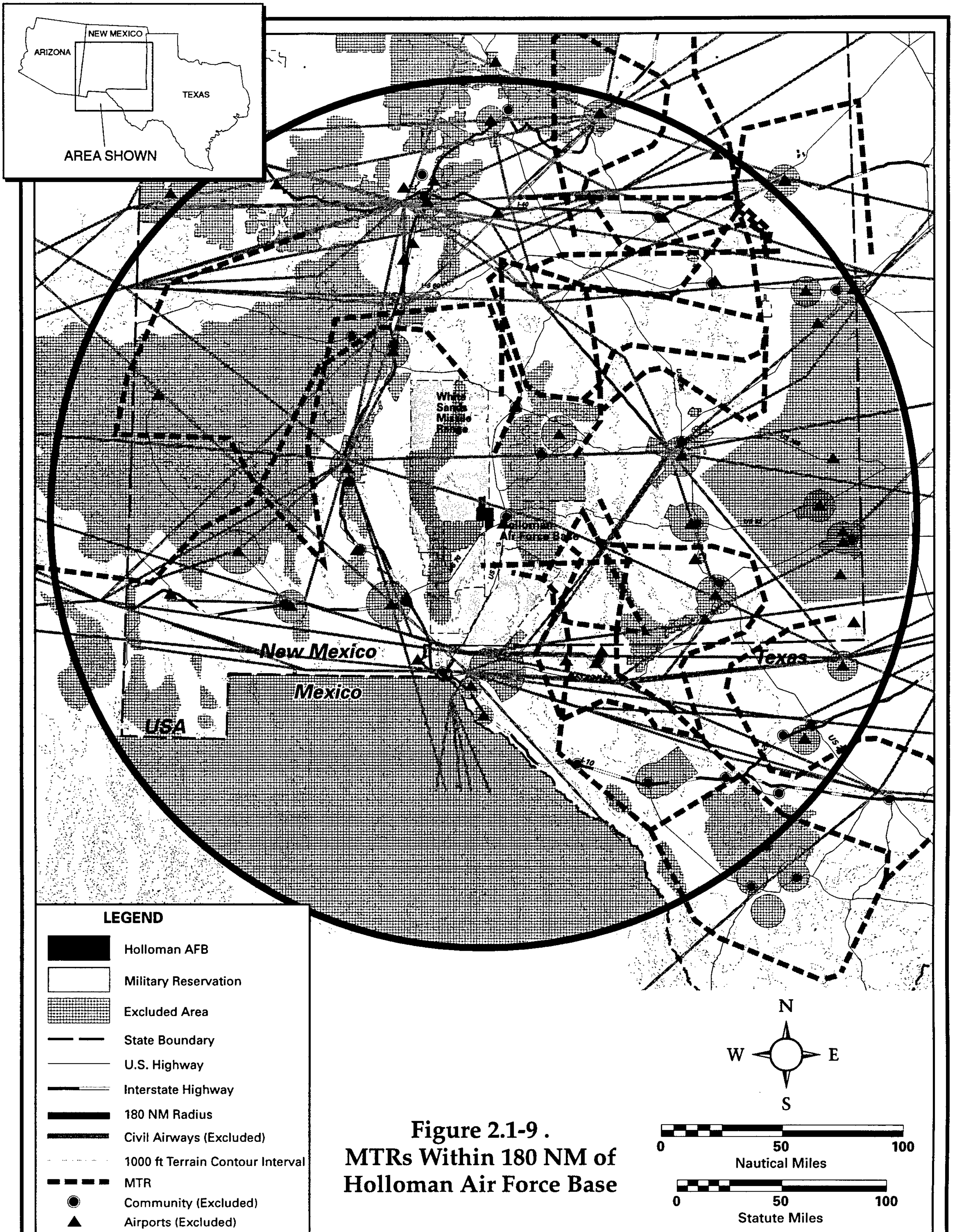


Figure 2.1-9 . MTRs Within 180 NM of Holloman Air Force Base

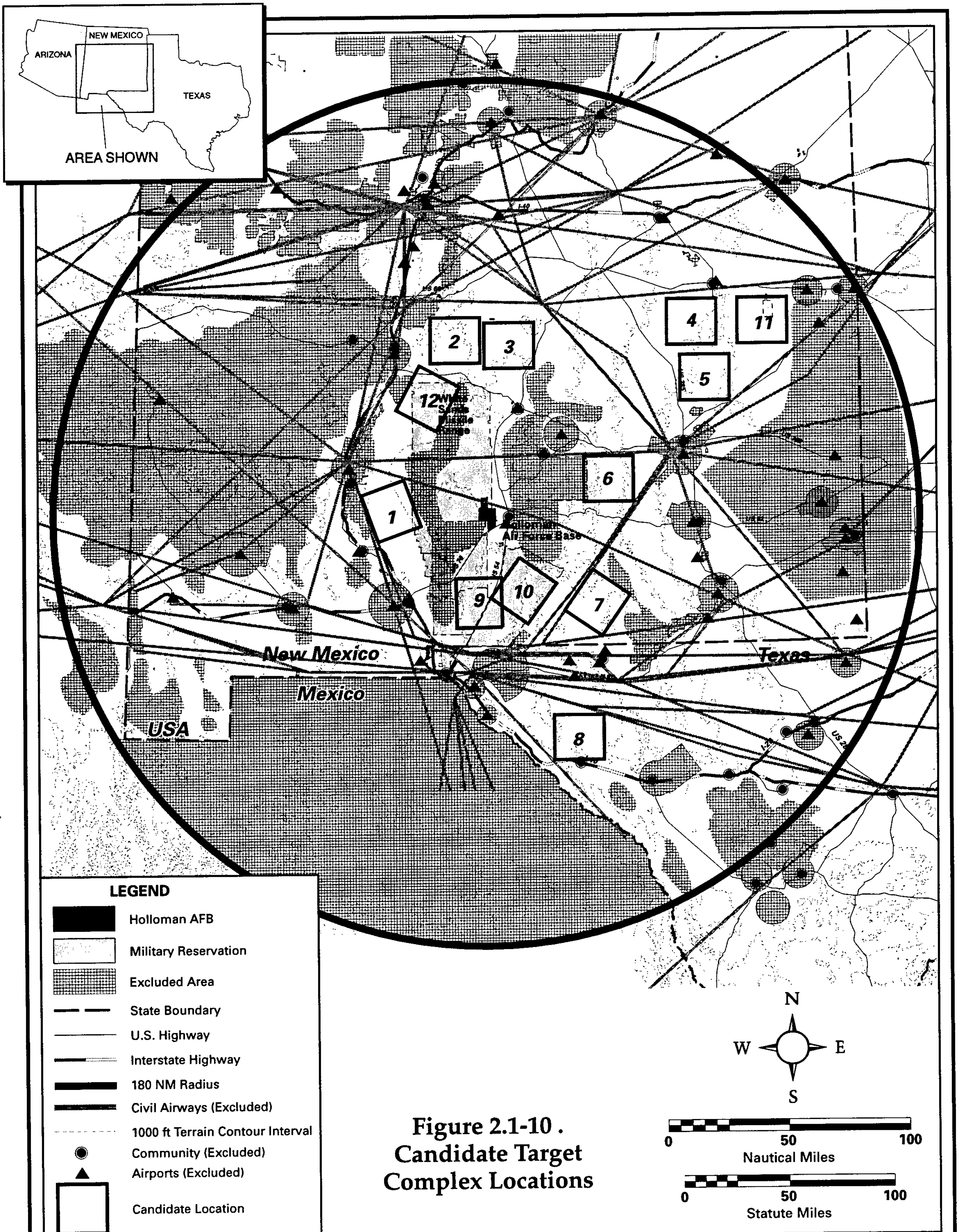


Figure 2.1-10 . Candidate Target Complex Locations

- In order to meet Tactical Combat Training Profile qualifications requirements, missions using TFR must be able to deliver their munitions within 75 feet of the target, which limits tolerable changes in elevation within 1.5 NM in front of the impact area to a maximum of 150 feet.

Figure 2.1-5 defines the area that lies within 180 NM of Holloman AFB. This area includes portions of Mexico, which were eliminated from consideration. Figure 2.1-6 adds public use airports, Class C and D airspace, a buffer zone around airports with instrument approaches, and civil airways, which were excluded from consideration. Figure 2.1-7 adds communities, parks, wilderness areas, wildlife refuges, and Native American reservations to the excluded areas. Finally, Figure 2.1-8 adds terrain contours at 1,000-foot intervals for New Mexico and Texas, showing areas with extreme elevation changes that would not meet the selection criteria. Comparable contours were not available for areas in Arizona, so they were examined using U.S. Geological Survey (USGS) maps.

After excluding the unsuitable areas, the MTRs within the 180 NM radius were added (Figure 2.1-9), so that areas that do not provide access from an MTR could also be excluded from further consideration. The remaining areas were then examined to determine whether they could accommodate a Restricted Area of the minimum 19-by-21 NM dimensions. Locations meeting this requirement and providing access from a suitable MTR are shown in Figure 2.1-10. A total of 12 locations were carried over into the second phase of the screening process.

Phase II Screening. The 12 candidate locations identified through the first screening phase were further evaluated to determine whether they would be able to provide a suitable site for the NTC. The selection criteria applied during this phase included considerations of operability, suitability, and compatibility. Operability criteria assessed the ability of candidate locations to offer the quality of air-to-ground training needed by both U.S. Air Force and GAF units at Holloman AFB. Suitability criteria addressed the ability to construct and operate the NTC, including obtaining the land and restricted airspace required. Compatibility criteria considered the NTC's effects on other military missions and on civilian land use and infrastructure. The specific criteria were:

<u>Operability criteria</u>

- Adequate flexibility to ensure the airspace configuration can accommodate all mission requirements. Locations that were marginally able to accommodate the minimum airspace size were examined more closely to determine whether other constraints such as terrain might reduce their utility to unacceptable levels.

- Combined flight duration. The 180 NM radius initially used to define the region of analysis was refined to assess the actual flight time associated with a candidate location. A typical NTC mission would involve a minimum of 20 minutes of low-level flight along an MTR, followed by NTC missions and return to Holloman AFB. The location of candidate sites relative to MTRs, as well as

Holloman AFB, was used during this phase of the screening to determine their operational feasibility.

- Accessibility and availability. Candidate locations were assessed to determine whether flight restrictions between Holloman AFB and the NTC, or the ability to obtain access to the Restricted Area, could interfere with acquiring sufficient time on the NTC to meet U.S. Air Force and GAF training requirements.

Suitability criteria

- Land availability. Land ownership patterns at candidate locations were examined to assess the feasibility of acquiring the land for the impact area and safety footprint. Locations with a large number of owners, including a combination of public and private land, were considered less suitable.

- Airspace availability. The process of establishing new Restricted Areas is lengthy and requires adequate justification to the FAA. Although not excluded from consideration, locations that would require a new Restricted Area were considered less suitable than those within an existing Restricted Area.

- Ability to overcome construction constraints. Candidate locations were examined to identify constraints that might render them unsuitable for construction of the NTC. While a single constraint might not render a location unsuitable, a preponderance of constraints, such as structures requiring demolition, extensive site preparation or cleanup requirements, or extensive roads and utility systems requiring relocation, might be sufficient to reduce a location's suitability to an unacceptable level.

Compatibility criteria

- Population displacement. Candidate locations were assessed for the extent to which their use for the NTC would involve displacement and/or relocation of residences or businesses.

- Mission conflicts. Candidate locations involving land currently used for military activities were assessed to determine whether the NTC would be compatible with the existing mission and could be accommodated through scheduling without unacceptably degrading the existing military mission.

- Transportation access. Candidate locations were examined to assess whether the NTC would interfere with use of public roads and transportation access through the area.

- Land use impacts. Candidate locations were assessed for the extent to which the NTC might be expected to displace current civilian land use or involve actions prohibited by Federal law.

- Compatibility with civil aviation. Consideration was given to whether use of the NTC at the candidate locations would interfere with civil aviation.

Applying these criteria to the 12 candidate locations identified through the Phase I screening resulted in the elimination of 10 locations. Two locations, McGregor Range (Location 10) and Melrose Range (Location 11), were carried forward for detailed analysis. Following is a summary of the assessment of each candidate location, indicating the reasons for eliminating 10 of the locations from further analysis.

Location 1. This location is under existing Restricted Area airspace west of WSMR. It was eliminated from further consideration because of its flight distance from Holloman AFB, potential conflicts with research, development, testing, and evaluation (RDT&E) missions at WSMR, and because it would require withdrawal of public lands and acquisition of state and private lands to assemble sufficient area to accommodate the NTC and associated safety footprints. Although this location lies within a 180 NM radius of Holloman AFB, accessing the base would require flying through WSMR airspace, which is frequently closed to transient military air traffic while RDT&E missions are taking place. When access through WSMR airspace is not available, aircraft must circumnavigate WSMR to reach Holloman AFB.

Location 2. Another location within existing restricted airspace north of WSMR was rejected primarily because of excessive changes in terrain. It was also undesirable due to potential mission conflicts and flight distance from Holloman AFB. Since it would be within existing WSMR airspace, it would create similar accessibility problems that the U.S. Air Force currently experiences at the Red Rio and Oscura target complexes. It would require acquisition of state and privately owned land.

Locations 3, 4, and 5. These locations were eliminated from further consideration because they would require new restricted airspace and acquisition of multiple parcels of predominantly private land, intermixed with some public and state lands. In addition, the locations are crossed by an extensive road network and other improvements (wells, utility lines, and private landing strips). Some of these infrastructure improvements would need to be closed or relocated if any of these locations were to be selected for establishment of an NTC.

Location 6. This location was rejected in part because it would require new restricted airspace. After taking into account existing civil airways, and the nearby Mescalero Indian Reservation, it was found that a new Restricted Area could be accommodated in one configuration. However, when this configuration was examined in detail, it was found that the terrain variation was relatively high in the underlying area, and presented terrain features that could not be avoided within the constrained airspace configuration.

Location 7. This location was rejected in part because it would require the establishment of new airspace, and the configuration of that airspace would be highly constrained by civil airways. Terrain variations and the presence of

numerous drainages within this location would severely hamper construction and operation of the NTC.

Location 8. This location would require new restricted airspace, and terrain constraints in combination with civil airways would limit the flexibility and configuration of that airspace. The main deficiency of this location, and the reason it was eliminated from further consideration, is that it would involve purchasing a large number of privately owned parcels of land from many different owners and displacing existing private land uses.

Location 9. This location is in Doña Ana Range, west of McGregor Range. It was eliminated for severe operability, suitability, and compatibility shortcomings. The available restricted airspace would significantly constrain options for use of the NTC. Siting the NTC on Doña Ana Range would also present either severe terrain constraints or require displacement of existing Army infrastructure and missions. The only area with acceptable terrain would create unacceptable conflicts with mission activities at both Fort Bliss and WSMR, including WSMRs missile launch sites north of Doña Ana Range.

Location 10. This location is comprised of the McGregor Range portion of Fort Bliss. It was found to meet all NTC selection criteria and was carried over for detailed analysis. As part of the detailed analysis, six sites on McGregor Range were evaluated, and four were rejected as not meeting the criteria. They include the existing target in the northwest portion of the range (which would need to be expanded to incorporate the proposed NTC); a site in the foothills area of the Sacramento Mountains; a site in the eastern portion of Otero Mesa (west of Mesa Horse Camp); and a site in the Tularosa Basin, just south of State Road 506. The reasons for eliminating these sites from further consideration are summarized below:

- **Existing Target.** The site of the existing target was eliminated due to airspace and terrain restrictions. Its location just west of the Sacramento Mountains foothills makes it unsuitable for the Tornado TF delivery profiles. Also, since it is located near the edge of the restricted airspace, it would not provide sufficient aircraft maneuver area. This site could not support a number of the delivery profiles that GAF and U.S. Air Force aircrews need to execute. In addition, State Road 506 would lie within the safety footprint of the target complex and would be subject to increased closures or need relocation. The existing powerline north of State Road 506 would need to be relocated.

- **Sacramento Foothills.** The foothills site also presented unacceptable terrain conditions and similar limitations in the restricted airspace as described above for the existing target site. Its safety footprint would overlap both State Road 506 and the existing powerline north of the highway. In addition, this site is very close to the Culp Canyon WSA, which would be subject to a significant increase in overflights and noise exposure.

- **East Otero Mesa.** The east Otero Mesa site performed well against operability criteria, but presented several conflicts with joint-use activities in that portion of McGregor Range. In addition to affecting a larger number of grazing units than the West Otero Mesa optional site, it also had the potential for adversely affecting more existing water lines that supply watering tanks on the mesa.

- **Orogrande Site.** This site is located on McGregor Range due east of Orogrande. The site was eliminated primarily because of terrain conflicts. It is located closer to the foothills area than the two sites carried over for detailed analysis, and, as a result, aircraft on TF patterns would not have sufficient area to turn around without coming close enough to the foothills to trigger the TFRs avoidance maneuvers. The NTC's safety footprint would also overlap State Road 506 at this site, as well as the powerline, which would have to be relocated.

Two sites on McGregor Range (the West Otero Mesa site and the Tularosa Basin site) were retained as options.

Location 11. Location 11 consists of the existing Melrose Range. While this location is too distant to be usable for all Tornado air-to-ground operations, in combination with increased use of WSMR targets, it was carried over for detailed analysis as part of the Existing Range training option.

Location 12. This location is on WSMR land and within WSMR restricted airspace, west of the San Andres Mountains. The impact area would fit within existing DOD land, but the safety footprint would extend beyond the existing boundary, across U.S. Highway 380. In addition to requiring acquisition of private and public lands for the safety footprint, this location would result in a requirement to either relocate U.S. 380 or close it on a regular basis. Since the site would be within WSMR airspace, accessibility would be subject to the same constraints currently affecting use of Red Rio and Oscura target areas. For these reasons, this location was eliminated from detailed consideration.

2.1.4.3 Components Common to the NTC Training Options

General Description of an NTC. Figures 2.1-11 and 2.1-12 show the location of the two sites being considered for an NTC on McGregor Range. In most respects, construction at these two sites would be identical; however, the Tularosa Basin site would require more extensive access road construction, more preconstruction site preparation, and a longer construction time than the West Otero Mesa site. The following discussion applies equally to both sites.

The complex would include an impact area measuring two by four statute miles (SM), within a 12 by 15 SM safety area. Public access to the impact area would be precluded at all times; access to the safety area would be allowed when the impact area was not in use. Construction activities would be primarily confined within the 5,120-acre impact area for either NTC training option. However, the extent of disturbed area would be significantly different for these two options. For the West

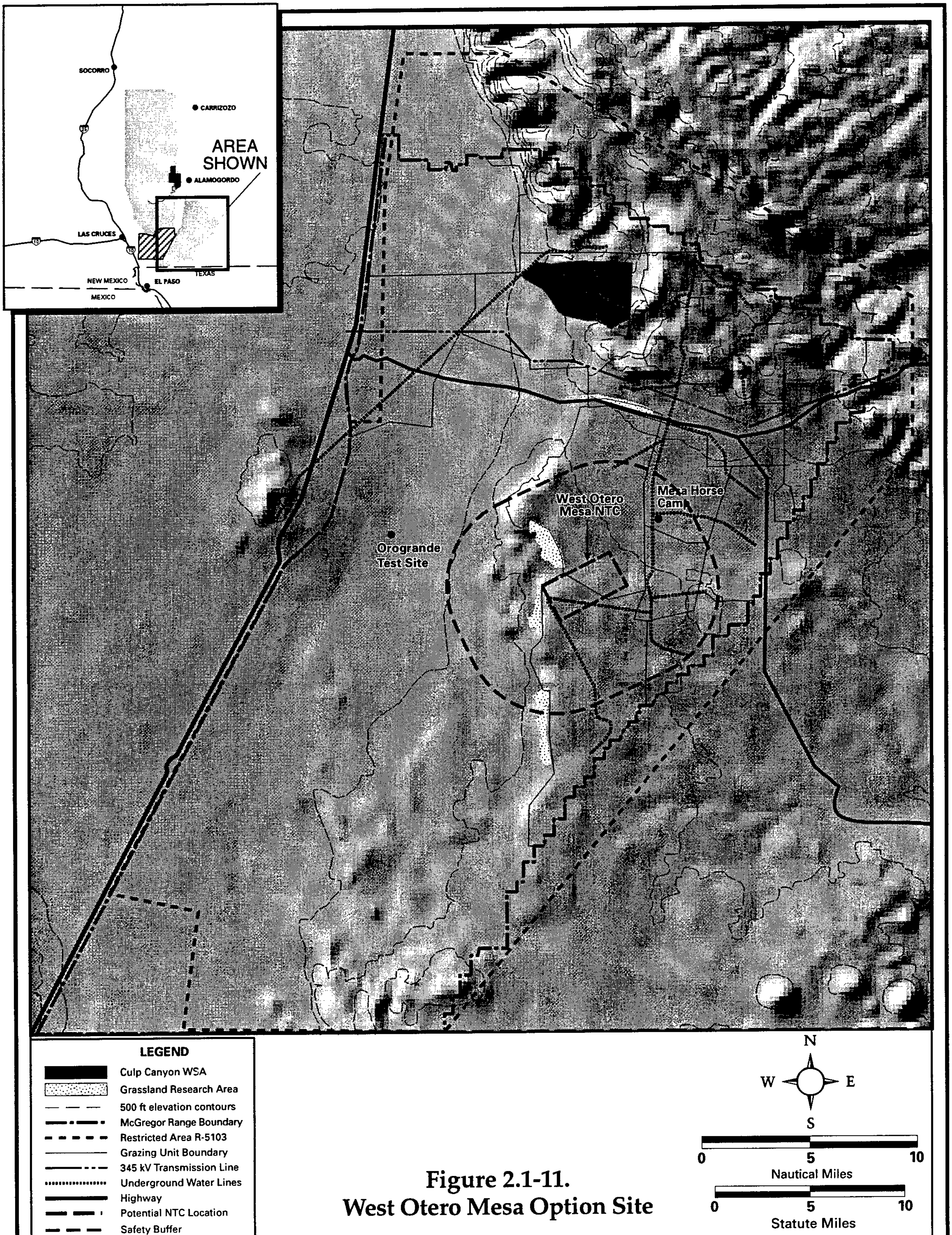


Figure 2.1-11.
West Otero Mesa Option Site

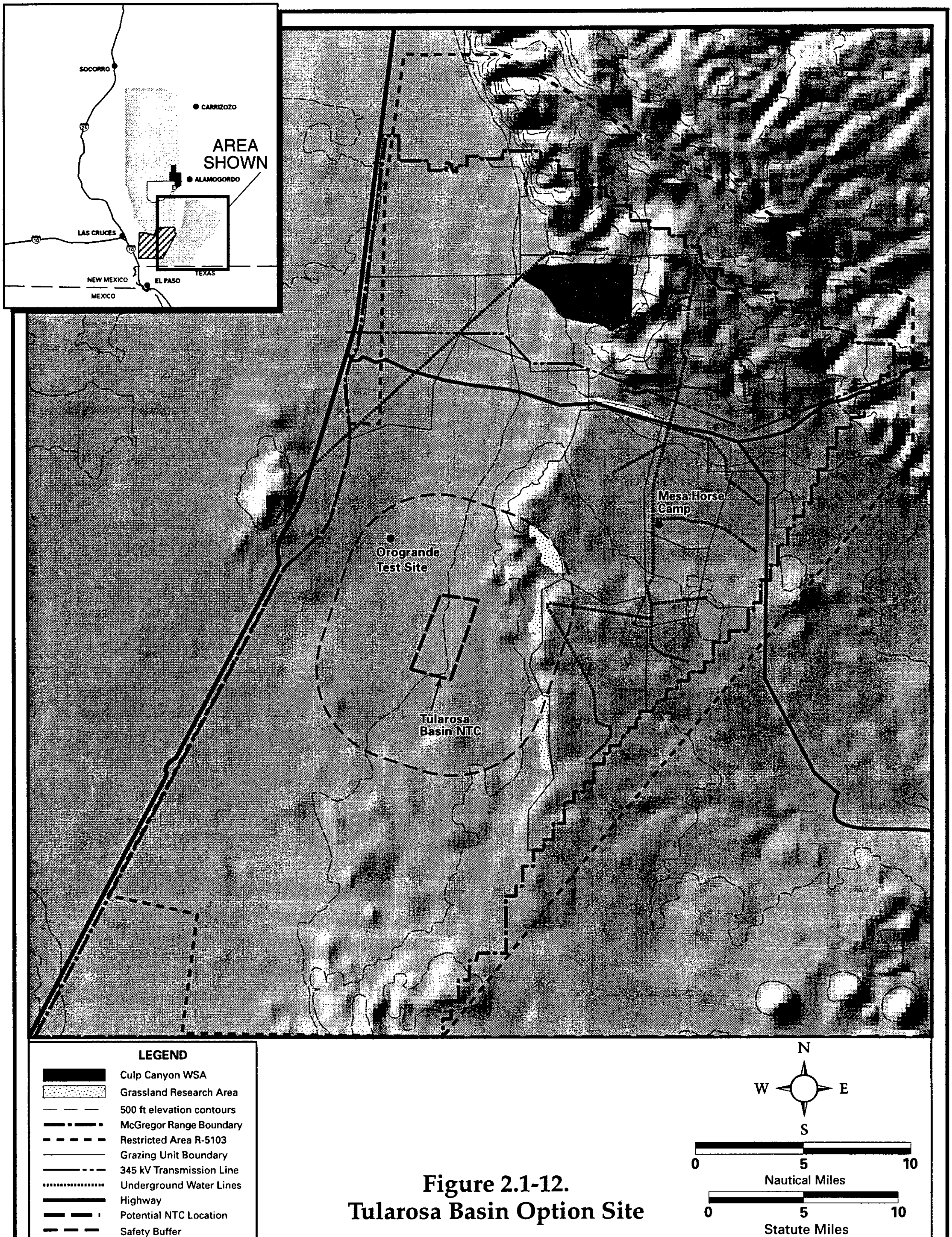


**Figure 2.1-12.
Tularosa Basin Option Site**

Otero Mesa site, the construction is assumed to involve approximately 20 percent of the site (1,024 acres). For the Tularosa Basin site, it is assumed that the entire impact area (5,120 acres) would be disturbed by construction.

The greater disturbance area at the Tularosa Basin site is a result of the greater requirements for removal of unexploded ordnance (UXO; see Section 2.1.4.4).

Construction common to either NTC would include a firebreak road around the perimeter, installation of a barbed wire fence along the full length of the firebreak road centerline, and construction of individual target arrays.[1] Design of the target arrays has not been completed for either site. Target arrays would be designed to simulate actual facilities, located within the area circumscribed by the perimeter fence and the firebreak road. These target arrays would include features such as the following:

Simulated Airfield Complex. This complex would include simulations of a runway, taxiways, revetted aircraft, hardened bunkers, open parking ramps, maintenance areas, command post, air defense artillery sites, radar, and other support complexes.

Simulated Industrial Complex. This complex would contain simulations of at least one refinery, one chemical production facility, and two S-20 AAA sites.

Simulated Railyard. The railyard would consist of a minimum of two tracks with two to four cars per track and an S-60 AAA site.

Simulated Air Defense Sites. At least three air defense sites would be constructed. These sites would include an SA-2 site, an SA-5 complex, and a Ground Control Intercept site.

Simulated Forward Edge of Battle Area (FEBA) Arrays. Each array would contain mixed tank/armored personnel carrier formations, artillery pieces, a servicing convoy, and scattered air defense systems (SA-09/13/ZSU 23-4). A mobile SA-6/8 formation would be included in one array.

Simulated Convoys. A minimum of four simulated convoys would be positioned within the NTC. These would include one convoy crossing a bridge, one entering a tunnel, one of armored vehicles, and one exiting the industrial area.

The exact locations for these elements within the impact area have not yet been determined. Figure 2.1-13 provides a nominal layout for these features. Construction would be concentrated in the immediate vicinity of the proposed targets. The exact area that would be disturbed is dependent on site-specific details that are not yet available. Construction could, therefore, result in disturbance anywhere within the 5,120-acre impact area. Based on past experience at Oscura and Red Rio impact areas on WSMR, it is estimated that 20 percent of the impact area would be disturbed.

[1] The fence would be constructed of four-strand barbed wire. The top and bottom strands would be smooth; the two middle strands would be barbed. There would be at least 16 inches of clearance between the bottom strand and the ground.

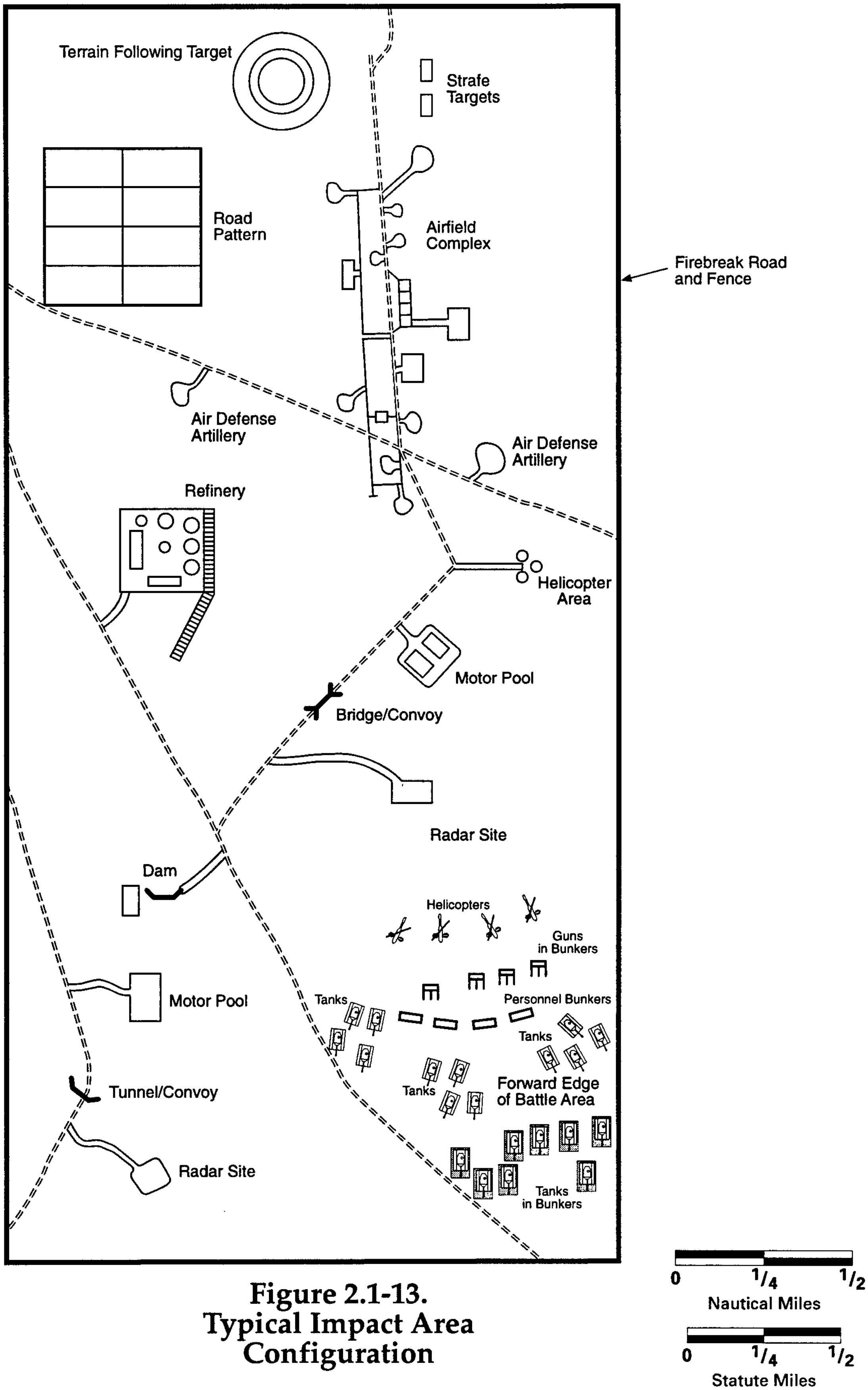


Figure 2.1-13. Typical Impact Area Configuration

Construction common to either NTC would also occur outside the impact area, but would disturb a substantially smaller area. As much as possible, access to the impact area would be gained by existing dirt roadways. Some improvement of these roadways would be required to accommodate both wheeled and tracked construction equipment, and semi-tractor/trailers. The extent of the area affected by this requirement has not been determined; for analytical purposes, it is assumed that approximately 80 acres of land would be disturbed over a period of three months.

This proposed action also includes the installation of TOSS components at the NTC. The TOSS permits remote scoring of bombing accuracy. The TOSS would be powered by solar panels. Data would be relayed from the TOSS components to the TOSS center at Holloman AFB via microwave relays. All equipment, including the solar panels, storage batteries, and microwave relays, would be enclosed within a security fence and positioned within the firebreak road. Installation of the TOSS components would involve minimal surface disturbance.

The NTC would be unmanned. Using the NTC would not result in increased water consumption or sewage generation. Electrical requirements for the TOSS would be met through use of photoelectric cells. Using the impact area would result in the accumulation of target area scrap and ordnance residue at the site. These materials would be disposed of annually.

Fort Bliss would have primary responsibility for the management of McGregor Range. The management of the NTC would be the responsibility of the U.S. Air Force. The NTC would be managed in much the same manner as the existing Red Rio and Oscura impact areas.

The U.S. Air Force would work with Fort Bliss and other resource specialists during design and construction of the proposed NTC to ensure its layout, including access roads, would avoid highly erodible soils and result in minimal vegetation and soil loss and earth disturbance. Topsoil removed for target and road construction would be stockpiled and reused after construction activities are completed. In addition, the U.S. Air Force would work with resource specialists to identify areas where vegetation reestablishment would be prudent (to minimize continued erosion and reduce weed species establishment) and to identify the most appropriate revegetation methods. Maintenance of the NTC roads and monitoring of biological resources would follow Fort Bliss requirements as identified in the Fort Bliss Integrated Natural Resource Management Plan and Fort Bliss maintenance procedures.

Airspace Requirements for a New Target Complex. Both NTC training options would be used by GAF, Holloman, and other DOD aircraft. However, the beddown would not require any change in airspace structure, but it would result in changes in use of various military airspace units (MTRs, MOAs, and Restricted Areas) in southern New Mexico, western Texas, and a relatively small portion of eastern Arizona. The NTC, as discussed in Section 2.1.4.2, would use a 19- by 21-NM allotment of the selected range's existing restricted airspace. A proposal pending

FAA approval, *Environmental Assessment of Proposed Airspace Modifications to Support Units at Holloman Air Force Base, New Mexico* (U.S. Air Force, 1997a), involves airspace modifications in southern New Mexico and west Texas. This proposed action involves modifications of existing ALCM routes to form consolidated Instrument Route (IR)-102/141. In addition, this action would expand Talon MOA in central New Mexico to the west and south, and lower the floor of the southern portion of the western half of the MOA to 300 feet. Finally, this action would establish an aerial refueling anchor, AR-X652, in west Texas. If implemented, the modified airspace would be used under this action; if these airspace modifications are not implemented, existing airspace would be used. This would result in a redistribution of sorties to other affected airspace.

Figure 2.1-14[1] shows the location of MOAs and Restricted Areas near Holloman AFB. Figure 2.1-15[2] shows the location of the affected MTRs[3]. Airspace structure in the immediate vicinity of Holloman AFB and WSMR is complex. Figure 2.1-16 presents a detailed view of subdivisions of the Restricted Areas overlying and surrounding WSMR. Some of these subdivisions (e.g., R-5107B) are further subdivided as named airspace units (e.g., Lava East and Lava West), used for air-to-air combat training (Figure 2.1-17). Under the NTC training options, some sorties would be directed toward specific target complexes on WSMR (i.e., Red Rio and Oscura impact areas within the corresponding Red Rio and Oscura safety areas) shown in Figure 2.1-18. Aircraft undertaking sorties to these impact areas would use overlying airspace within R-5107B. Table 2.1-5 provides data on FY95 operations within potentially affected airspace units. Table 2.1-6 shows expected levels of operations that would prevail if various other actions are fully implemented by FY00. Table 2.1-7 shows the changes in sortie numbers that would occur in FY00 if one or the other NTC training options were implemented. Table 2.1-8 shows flight profiles for various aircraft using these airspace units. Table 2.1-9 provides projected baseline airspace use for the year FY00 if the ALCM/Talon action is not implemented. Table 2.1-10 shows the airspace use under the proposed action if the ALCM/Talon action is not implemented.

Munitions and Chaff Use. The proposed action would result in changes in munitions expenditure to various ranges. These changes are shown in Table 2.1-11. Also shown are munition expenditures for the proposed NTC. Appendix C provides additional information on selected munitions. No change in the types of munitions used at these ranges would be required. This action would involve changes in quantities of both inert and live munitions use. The only location where live munitions expenditure would be affected is the Red Rio LDT. The Red Rio LDT may presently receive up to 600 live drops per year. During FY95, it received a total of about 210 live drops. This increased to 552 live drops per year in FY97, and is the

[1] This figure includes a depiction of proposed modifications to Talon MOA (U.S. Air Force, 1997a).

[2] This figure is a depiction of proposed modifications to IR-102/141 (U.S. Air Force, 1997a).

[3] For some missions, sorties are consistently flown only on a portion of a route. In these cases, the reduced portion of the MTR is referred to as Short, while the complete route is referred to as Long.

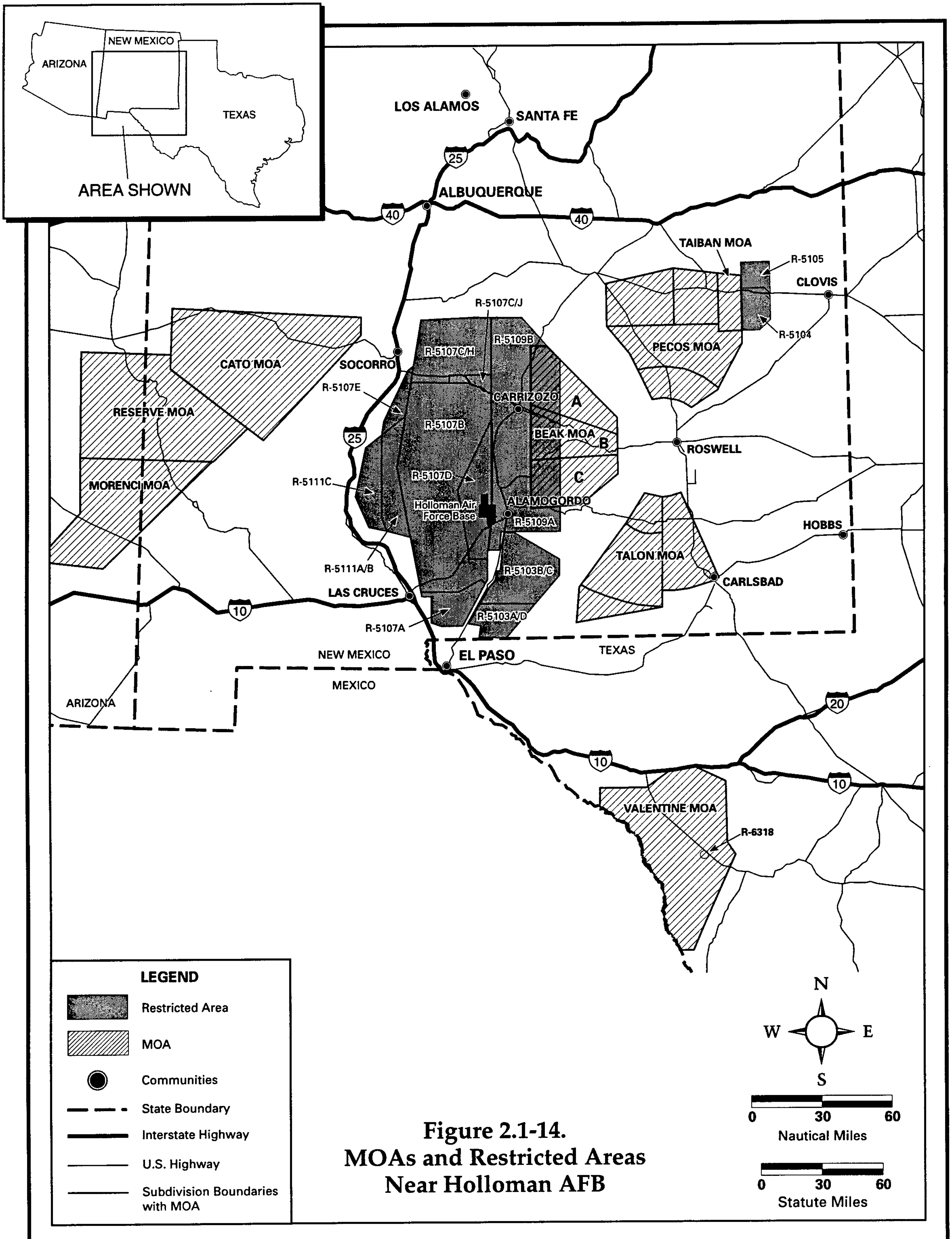


Figure 2.1-14. MOAs and Restricted Areas Near Holloman AFB

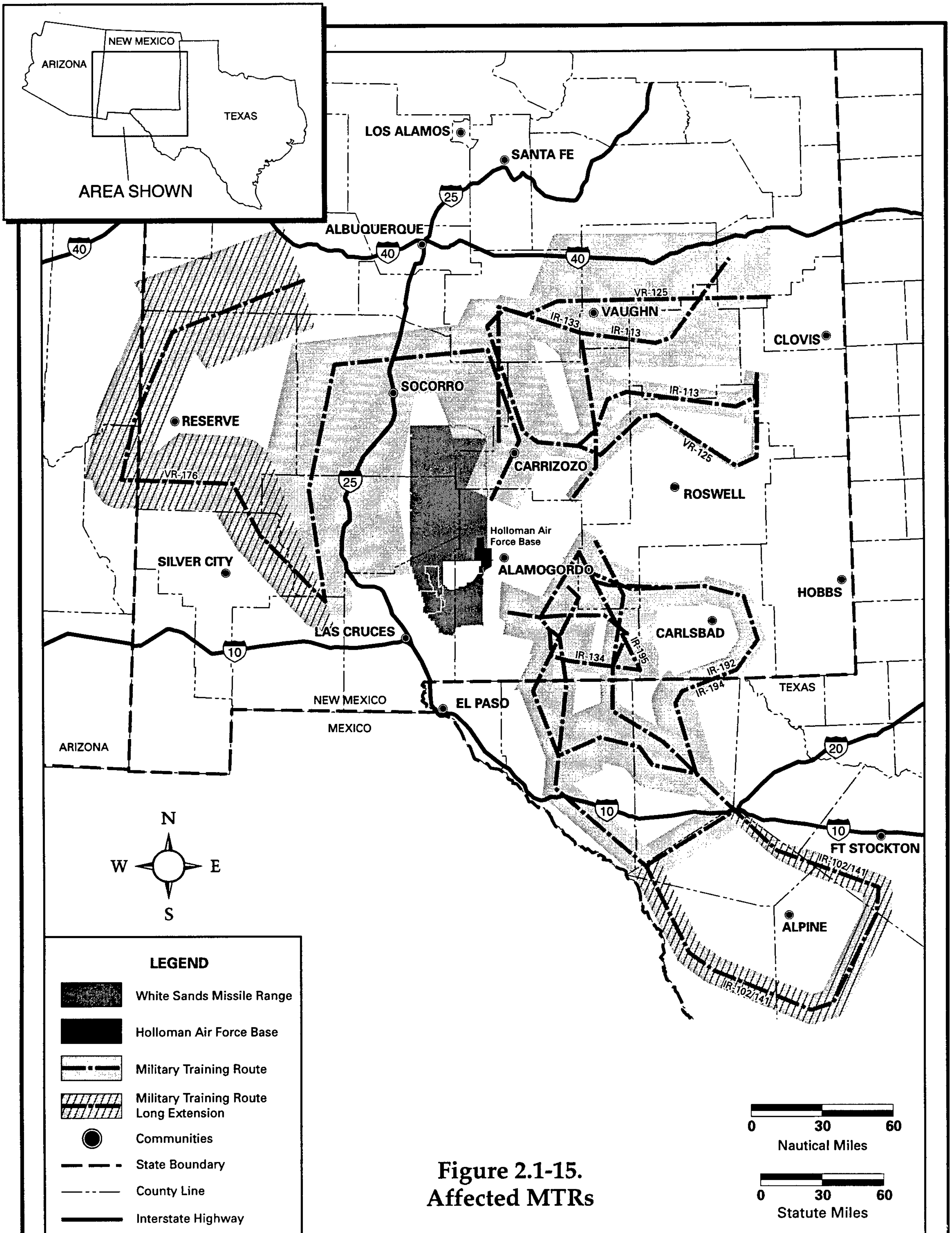


Figure 2.1-15.
Affected MTRs

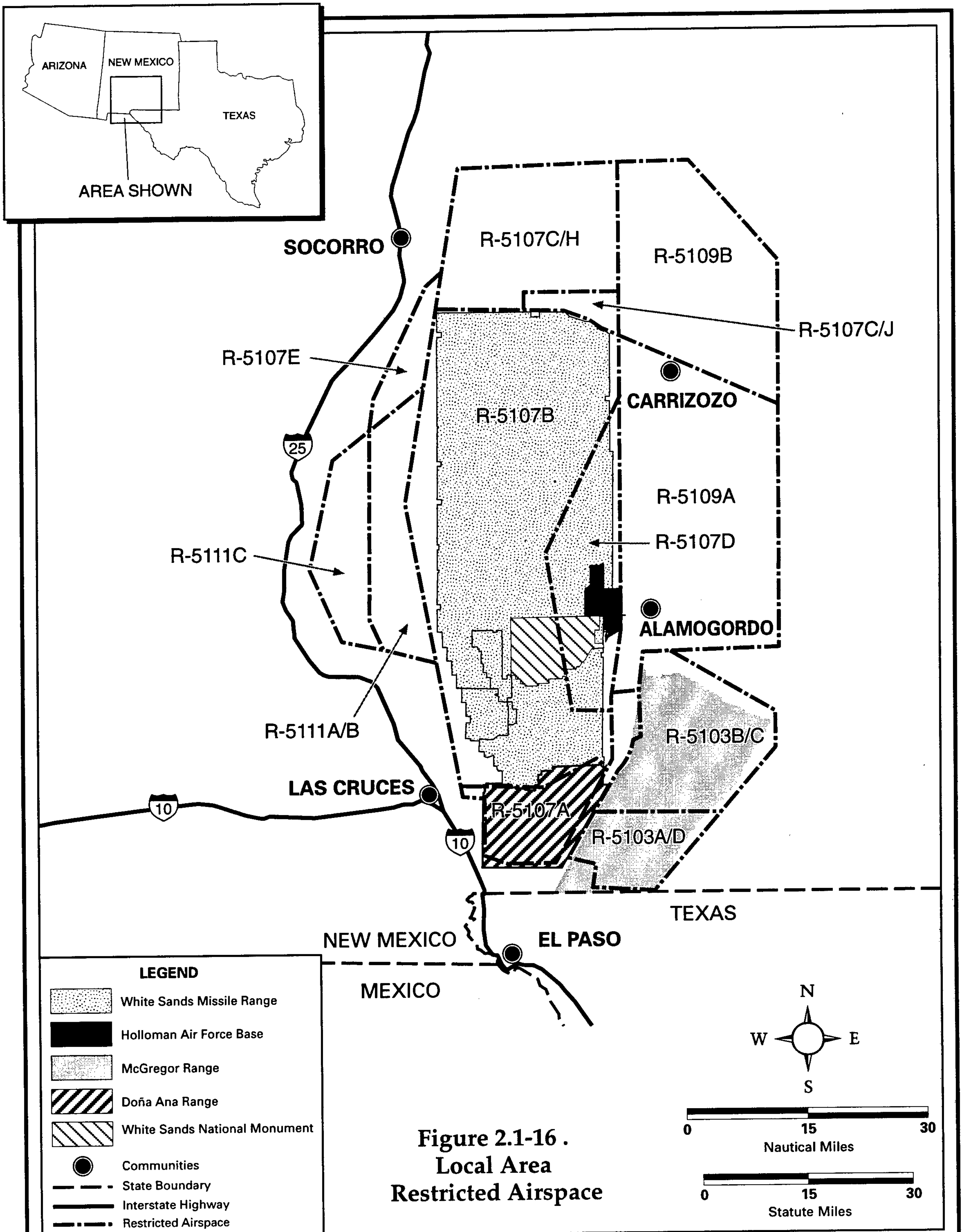


Figure 2.1-16. Local Area Restricted Airspace

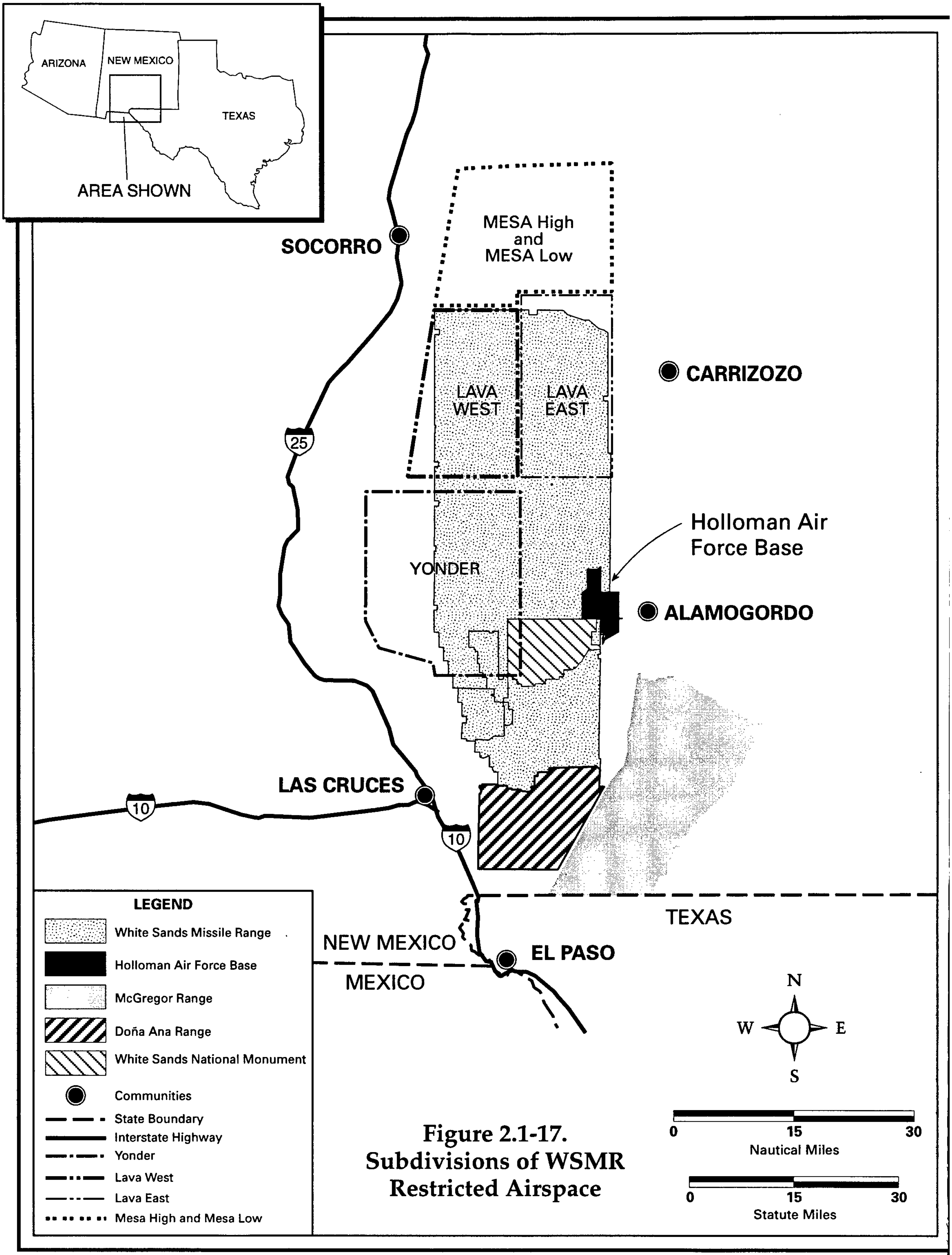


Figure 2.1-17. Subdivisions of WSMR Restricted Airspace

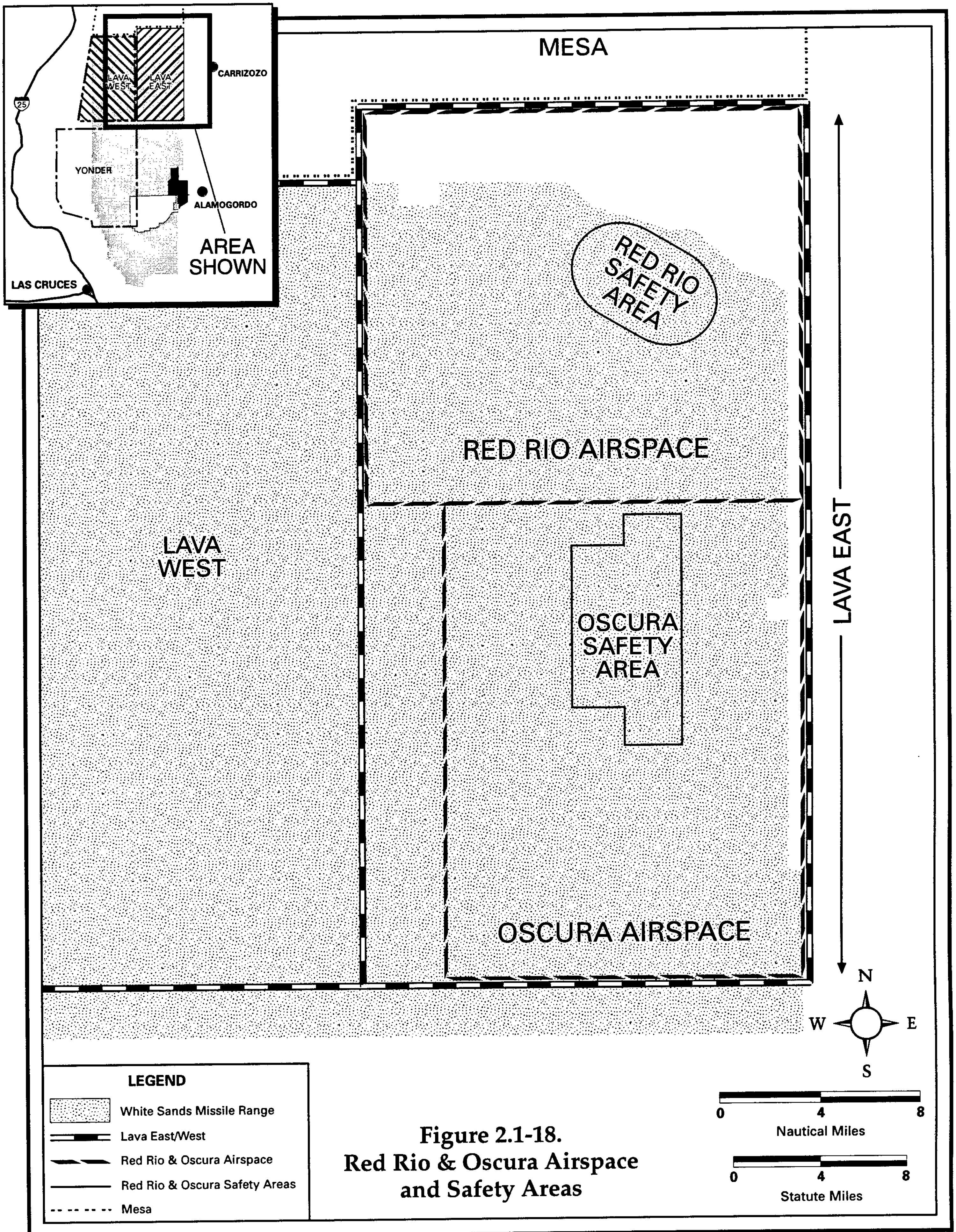


Figure 2.1-18. Red Rio & Oscura Airspace and Safety Areas

Table 2.1-5. Airspace Use for FY95 Conditions

	Sorties within MOAs											
	Beak A		Beak B		Beak C		Talon		Pecos High		Pecos Low	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N
A-10												
AT/T-38	456		456		456		859					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	966	4				
F-16	25		25		25		1		638		642	
F-18	20	8	20	8	25		18					
F/EF-111	1								2,157	35	1,076	26
F-117												
HH-53												
HH-60												
Other												
TOTAL	780	13	768	12	726	4	1,844	4	2,879	35	1,816	26

	Air-to-Air Sorties within Restricted Areas									
	R-5107 Lava East/West		R-5107 Mesa High		R-5107 Mesa Low		R-5107 Yonder		R-5103 McGregor High	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10										
AT/T-38	85		123		2		158		242	
B-1										
B-52										
C-130										
F-4	947	32	1,014	32	963	32	310		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F/EF-111										
F-117	4,048	800	4,048	800						
HH-53										
HH-60										
Other	18	4	14		14					
TOTAL	5,593	884	5,691	864	1,477	64	482		476	

	Air-to-Ground Sorties within Restricted Areas									
	R-5107 Red Rio		R-5107 Oscura		R-5103 McGregor Low		R-5103 NTC		R-5104/5 Melrose	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10	240		22		22					
AT/T-38	162		498		798					
B-1									48	4
B-52									82	3
C-130										
F-4	94		110		331				10	
F-16	410	50	372	156					648	65
F-18										
F/EF-111	14		33						4,015	1,102
F-117	4,074	1,018	141	1					144	49
HH-53	120	30	115	10						
HH-60	74	18	95	5					7	18
Other	24	4							17	2
TOTAL	5,212	1,120	1,386	172	1,151				4,971	1,243

	Sorties along MTRs																					
	VR-100/125		VR-176 Short		VR-176 Long		IR-102 Long		IR-102 Short		IR-113		IR-133		IR-134/195		IR-141 Short		IR-141 Long		IR-192/194	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
A-10	8	2									4				8							
AV-8	2																					
T-38													88		114							
B-1																						
B-52																						
C-130			225		25																	
F-4			6		1								143		16							
F-16	8	2	450		50								2									
F-18	8																					
F-111	659	5	593		66						1,169	37	28									
F-117																						
HH-53																						
HH-60																						
Other													3		7							
TOTAL	685	9	1,274		142						1,173	37	264		145							

D = Day 7:00 am to 10:00 pm
N = Night 10:00 pm to 7:00 am

Table 2.1-6. Projected Airspace Use for FY00 Baseline

	Sorties within MOAs											
	Beak A		Beak B		Beak C		Talon		Pecos High		Pecos Low	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N
A-10												
AV-8												
T-38	182		182		182		343					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	966	4				
F-16	25		25		25		1		2740	60	3970	80
F-18	20	8	20	8	25		18					
F-117												
HH-53												
HH-60												
Other												
Tornado	31		41		29		250	50				
TOTAL	536	13	535	12	481	4	1578	54	2824	60	4068	80

	Air-to-Air Sorties within Restricted Areas									
	R-5107 Lava East/West		R-5107 Mesa High		R-5107 Mesa Low		R-5107 Yonder		R-5103 McGregor High	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10										
AV-8	4		4		4					
T-38	34		49		1		63		97	
B-1										
B-52										
C-130										
F-4	947	32	1014	32	963	32	310		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F-117	4048	800	4048	800						
HH-53										
HH-60										
Other	14	4	10		10					
Tornado	75		34		63					
TOTAL	5617	884	5651	864	1539	64	387		331	

	Air-to-Ground Sorties within Restricted Areas									
	R-5107 Red Rio		R-5107 Oscura		R-5103 McGregor Low		R-5103 NTC		R-5104/5 Melrose	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10	240		22		22					
AV-8										
T-38										
B-1									48	4
B-52									82	3
C-130										
F-4	94		110		331				10	
F-16	410	50	372	156					7398	822
F-18										
F-117	4074	1018	141	1					144	49
HH-53	120	30	115	10						
HH-60	74	18	95	5					7	18
Other	24	4							17	2
Tornado	400	20	600	40	480				100	40
TOTAL	5436	1140	1455	212	833				7806	938

	Sorties along MTRs																					
	VR-100/125		VR-176 Short		VR-176 Long		IR-102 Short		IR-102 Long		IR-113		IR-133		IR-134/195		IR-141 Short		IR-141 Long		IR-192/194	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
A-10		2					2				4				8		6		1			
AV-8	2																					
T-38	1						2								4		5	1	1			
B-1							7		2								17		4			
B-52							4		1								11		3			
C-130			225		25																	
F-4			36		4		7						52		25		20				21	
F-16	1036	116	630		70		10		2		518	58			8		22		6			
F-18	8						2		1								5	1	1			
F-117																						
HH-53																						
HH-60																						
Other			45		5		10		5				2		7		26	4	5			
Tornado	55		100		5		96	10	24	3			1065	45	185	10	224	25	56	7	150	
TOTAL	1102	118	1036		109		140	10	35	3	522	58	1119	45	237	10	336	31	77	7	171	

D = Day 7:00 am to 10:00 pm

N = Night 10:00 pm to 7:00 am

Table 2.1-7. Proposed Airspace Use for the NTC Training Options

	Sorties within MOAs											
	Beak A		Beak B		Beak C		Talon		Pecos High		Pecos Low	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N
A-10												
AV-8												
T-38	182		182		182		343					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	966	4				
F-16	25		25		25		1		2740	60	3970	80
F-18	20	8	20	8	25		18					
F-117												
HH-53												
HH-60												
Other												
Tornado	209	17	209	17	209	17	1199	14	67	4	67	4
TOTAL	714	30	703	29	661	21	2527	18	2891	64	4135	84

	Air-to-Air Sorties within Restricted Areas									
	R-5107 Lava East/West		R-5107 Mesa High		R-5107 Mesa Low		R-5107 Yonder		R-5103 McGregor High	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10										
AV-8	4		4		4					
T-38	34		49		1		63		97	
B-1										
B-52										
C-130										
F-4	947	32	1014	32	963	32	310		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F-117	4048	800	4048	800						
HH-53										
HH-60										
Other	14	4	10		10					
Tornado	620	20	195	7	679	19	72	5	68	9
TOTAL	6162	904	5812	871	2155	83	459	5	399	9

	Air-to-Ground Sorties within Restricted Areas									
	R-5107 Red Rio		R-5107 Oscura		R-5103 McGregor Low		R-5103 NTC		R-5104/5 Melrose	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10	120		22				142			
AV-8										
T-38										
B-1									48	4
B-52									82	3
C-130										
F-4	45		10		50		430		10	
F-16	410	50	372	156					7398	822
F-18										
F-117	4015	666	200	10				352	144	49
HH-53	120	30	115	10						
HH-60	27	42	42	65			8	8	7	18
Other	24	4							17	2
Tornado	667	3	933	7	50		2348	129	133	7
TOTAL	5428	795	1694	248	100		2928	489	7839	905

	Sorties along MTRs																					
	VR-100/125		VR-176 Short		VR-176 Long		IR-102 Short		IR-102 Long		IR-113		IR-133		IR-134/195		IR-141 Short		IR-141 Long		IR-192/194	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
A-10		2					2				4				8		6		1			
AV-8	2																					
T-38	1						2								4		5	1	1			
B-1							7		2								17		4			
B-52							4		1								11		3			
C-130			225		25																	
F-4			36		4		7						52		25		20				21	
F-16	1036	116	630		70		10		2		518	58			8		22		6			
F-18	8						2		1								5	1	1			
F-117																						
HH-53																						
HH-60																						
Other			45		5		10		5				2		7		26	4	5			
Tornado	100		667		75		152	6	81	2	163	7	1221	16	977	66	460	16	177	6	594	43
TOTAL	1147	118	1603		179		196	6	92	2	685	65	1275	16	1029	66	572	22	198	6	615	43

D= Day 7:00 am to 10:00 pm

N = Night 10:00 pm to 7:00 am

Table 2.1-8. Aircraft Flight Profiles

Airspace Unit	Aircraft Type	Operations Data			Altitude Profile (% Sorties by Altitude Class in Feet AGL)					
		Avg. Mins. in Airspace	Avg. % Power	Avg. KIAS	100-299	300-499	500-999	1,000-4,999	5,000-9,999	10,000+
MOAs and	F-4	30	98	400		1	1	8	45	45
Restricted Airspace	Tornado	40	90	440		40	20	20	10	10
(Excluding	T-38	30	90	300				20	40	40
High-Altitude	F-16	20	95	420			25	25	25	25
Training Missions)	F-111F	20	90	450		1	1	1	20	77
	Other	30	81	450		1	1	5	73	20
Restricted Areas	F-117	5	92	425				10	10	80
Used for Air-to-Ground	F-4	30	98	480	1	3	3	40	52	1
Combat Training	Tornado	20	98	450	10	26	26	18	17	3
Missions	T-38	30	90	350		10	30	50	10	
	F-16	30	95	500	5	5	15	45	15	15
	F-111F	20	90	500	5	5	53	25	10	2
	Other	30	81	500		10	20	60	10	
MTRs	F-4	40	98	420		25	75			
	Tornado (D)	40	93	450	10	80	10			
	Tornado (N)	40	93	450	10*	45	45			
	T-38	40	90	420			80	20		
	F-16	40	95	480			90	10		
	F-111F	40	90	500		75	15	10		
	Other	40	81	480		20	70	10		

KIAS: Knots Indicated Airspeed D: 7:00 am to 10:00 pm N: 10:00 pm to 7:00 am * Between 200 and 300 feet AGL

Table 2.1-9. Airspace Use for FY00 Baseline if ALCM/Talon is not Implemented

Sorties within MOAs

Aircraft	Beak A D	Beak A N	Beak B D	Beak B N	Beak C D	Beak C N	Talon D	Talon N	Pecos High D	Pecos High N	Pecos Low D	Pecos Low N
A-10												
AV-8												
T-38	182		182		182		343					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	897	4				
F-16	25		25		25		1		2740	60	3970	80
F-18	20	8	20	8	25		18					
F-117												
HH-53												
HH-60												
Other												
Tornado	31		41		29		50					
TOTAL	536	13	535	12	481	4	1309	4	2824	60	4068	80

Air-to-Air Sorties within Restricted Areas

Aircraft	R-5107 Lava East/West D	R-5107 Lava East/West N	R-5107 Mesa High D	R-5107 Mesa High N	R-5107 Mesa Low D	R-5107 Mesa Low N	R-5107 Yonder D	R-5107 Yonder N	R-5103 McGregor High D	R-5103 McGregor High N
A-10										
AV-8	4		4		4					
T-38	34		49		1		63		97	
B-1										
B-52										
C-130										
F-4	947	32	1014	32	963	32	379		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F-117	4048	800	4048	800						
HH-53										
HH-60										
Other	14	4	10		10					
Tornado	75		34		213		50	50		
TOTAL	5617	884	5651	864	1689	64	506	50	331	

Air-to-Ground Sorties within Restricted Areas

Aircraft	R-5107 Red Rio D	R-5107 Red Rio N	R-5107 Oscura D	R-5107 Oscura N	R-5103 McGregor Low D	R-5103 McGregor Low N	R-5103 NTC D	R-5103 NTC N	R-5104/5 Melrose D	R-5104/5 Melrose N
A-10	240		22		22					
AV-8										
T-38										
B-1									48	4
B-52									82	3
C-130										
F-4	94		110		331				10	
F-16	410	50	372	156					7398	822
F-18										
F-117	4074	1018	141	1					144	49
HH-53	120	30	115	10						
HH-60	74	18	95	5					7	18
Other	24	4							17	2
Tornado	400	20	600	40	480				100	40
TOTAL	5436	1140	1455	212	833				7806	938

Sorties along MTRs

Aircraft	VR-100/125 D	VR-100/125 N	VR-176 Short D	VR-176 Short N	VR-176 Long D	VR-176 Long N	IR-102 Short D	IR-102 Short N	IR-102 Long D	IR-102 Long N	IR-113 D	IR-113 N	IR-133 D	IR-133 N	IR-134/195 D	IR-134/195 N	IR-141 Short D	IR-141 Short N	IR-141 Long D	IR-141 Long N	IR-192/194 D	IR-192/194 N
A-10		2									4				8							
AV-8	2																					
T-38	1														4							
B-1																						
B-52																						
C-130			225		25																	
F-4			6										50		59						110	
F-16	1036	116	630		70						518	58			8							
F-18	8																					
F-117																						
HH-53																						
HH-60																						
Other			45		5								2		7							
Tornado	50	10	450		50								1105	50	150	40					150	
TOTAL	1097	128	1356		150						522	58	1157	50	236	40					260	

D = Day 7:00 am to 10:00 pm

N = Night 10:00 pm to 7:00 am

Table 2.1-10. Projected Airspace Use Under the Proposed Action if ALCM/Talon is not Implemented

	Sorties within MOAs											
	Beak A		Beak B		Beak C		Talon		Pecos High		Pecos Low	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N
A-10												
AV-8												
T-38	182		182		182		343					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	897	4				
F-16	25		25		25		1		2740	60	3970	80
F-18	20	8	20	8	25		18					
F-117												
HH-53												
HH-60												
Other												
Tornado	209	17	209	17	209	17	50		67	4	267	4
TOTAL	714	30	703	29	661	21	1309	4	2891	64	4335	84

	Air-to-Air Sorties within Restricted Areas									
	R-5107 Lava East/West		R-5107 Mesa High		R-5107 Mesa Low		R-5107 Yonder		R-5103 McGregor High	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10										
AV-8	4		4		4					
T-38	34		49		1		63		97	
B-1										
B-52										
C-130										
F-4	947	32	1014	32	963	32	379		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F-117	4048	800	4048	800						
HH-53										
HH-60										
Other	14	4	10		10					
Tornado	920	20	195	7	879	19	572	19	68	9
TOTAL	6462	904	5812	871	2355	83	1028	19	399	9

	Air-to-Ground Sorties within Restricted Areas									
	R-5107 Red Rio		R-5107 Oscura		R-5103 McGregor Low		R-5103 NTC		R-5104/5 Melrose	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10	120		22				142			
AV-8										
T-38										
B-1									48	4
B-52									82	3
C-130										
F-4	45		10		50		430		10	
F-16	410	50	372	156					7398	822
F-18										
F-117	4015	666	200	10				352	144	49
HH-53	120	30	115	10						
HH-60	27	42	42	65			8	8	7	18
Other	24	4							17	2
Tornado	667	3	933	7	50		2348	129	133	7
TOTAL	5428	795	1694	248	100		2928	489	7839	905

	Sorties along MTRs																					
	VR-100/125		VR-176 Short		VR-176 Long		IR-102 Short		IR-102 Long		IR-113		IR-133		IR-134/195		IR-141 Short		IR-141 Long		IR-192/194	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
A-10		2									4				8						9	
AV-8	2																					
T-38	1														4						8	1
B-1																					30	
B-52																					19	
C-130			225		25																9	1
F-4			36		4								52		25						48	
F-16	1036	116	630		70						518	58			8						40	
F-18	8																				9	1
F-117																						
HH-53																						
HH-60																						
Other			45		5								2		7						28	2
Tornado	100		407		260						163	7	1221	16	1131	66					1309	73
TOTAL	1147	118	1343		364						685	65	1275	16	1183	66					1509	78

D= Day 7:00 am to 10:00 pm

N = Night 10:00 pm to 7:00 am

Table 2.1-11. FY95 and FY00 Munitions Use for the NTC Training Options

Designator	Type	Oscura			Red Rio			Existing McGregor Range			New Target Complex			Melrose Range		
		FY95	FY00	Proposed Action	FY95	FY00	Proposed	FY95	FY00	Proposed	FY95	FY00	Proposed	FY95	FY00	Proposed
2.75 in	Rocket, Inert	50	50	50	100	100	100	0	0	0	0	0	50	0	0	0
2.75 in	Rocket, WP	50	50	50	100	100	100	0	0	0	0	0	0	0	0	0
20mm	TP	90,000	90,000	90,000	3,348	3,348	3,348	0	0	0	0	0	2,604	53,400	150,000	150,000
27mm (DM-38)	TP/TPT	0	0	22,909	0	4,320	4,320	0	0	0	0	0	25,833	0	0	0
30 mm	TP	15,000	15,000	15,000	15,000	15,000	15,000	0	0	0	0	0	15,000	0	0	0
40mm	TP	10,000	10,000	10,000	10,000	10,000	15,000	0	0	0	0	0	5,000	0	0	0
50 cal	TP/TPT/AP	47,586	47,586	47,586	142,758	142,758	95,172	0	0	0	0	0	47,586	0	0	0
7.62 mm	TP/TPT	535,941	535,941	535,940	1,607,821	1,071,881	1,071,881	0	0	0	0	0	535,941	0	0	0
BDU-33	SSPM	20,160	16,160	15,836	14,112	13,600	14,256	6,048	2,534	500	0	0	11,796	42,724	39,496	39,496
MK-106 (GAF DM-18)	SSPM	0	625	450	200	438	1,125	450	188	80	0	0	875	22,010	11,585	11,585
BDU-50	Inert	0	0	169	724	724	380	0	0	0	0	0	779	1,229	1053	600
GBU-10	Inert	0	0	0	33	33	15	0	0	0	0	0	12	97	50	50
GBU-12	Inert	0	0	0	262	262	118	0	0	0	0	0	92	307	120	120
GBU-27	Inert	0	0	0	3	3	1	0	0	0	0	0	1	0	0	0
GBU-10	Live	0	0	0	20	9	9	0	0	0	0	0	0	0	0	0
GBU-12	Live	0	0	0	20	20	20	0	0	0	0	0	0	0	0	0
GBU-27	Live	0	0	0	23	23	23	0	0	0	0	0	0	0	0	0
MK-82, Matra	Live	0	0	0	144	500	1,953	0	0	0	0	0	0	0	0	0
LUU 2	Flares, Illum.	20	20	20	30	30	30	0	0	0	0	0	20	0	0	0
MJ-10	Flares, SP	1,000	1,000	1,000	1,500	1,500	1,500	0	0	0	0	0	1,000	0	0	0
MJ-206	Flares, SP	1,000	1,000	1,000	1,500	1,500	1,500	0	0	0	0	0	1,000	0	0	0
MJU-7	Flares	2,250	2,250	4,500	20,250	20,250	10,125	0	0	0	0	0	7,875	1,600	2,000	2,000
MK-24	Flares, Illum.	20	20	20	30	30	30	0	0	0	0	0	20	0	0	0
RR-170	Chaff	0	0	0	0	0	0	0	0	0	0	0	0	8,580	7,000	7,000
RR-188	Chaff	0	0	0	734	734	734	0	0	0	0	0	0	5,841	20,000	20,000

AP: Armor Piercing
Illum: Illumination
SP: Self-Protection
SSPM: Subscale Practice Munition
TP: Target Practice
TPT: Target Practice Tracer
WP: White Phosphorus

FY00 baseline. Under the proposed action, use of the LDT would increase to 2,005 live drops per year. The proposed NTC would be authorized for subscale and full-scale inert munitions.

Table 2.1-11 includes data on pyrotechnic chaff use on affected ranges. This chaff is considered a munition because it uses an explosive charge to disperse the chaff upon release. The Tornado aircraft uses a mechanical shredder to dispense chaff; on this basis, chaff dispensed from the Tornado is not considered a munition, and subsequently is not listed in Table 2.1-11. The GAF currently uses chaff in WSMR airspace under an Electronic Countermeasures (ECM) permit, and also in conjunction with exercises that specifically allow the use of Tornado chaff. Assuming that the annual ECM permits will continue (as is currently expected), under the proposed action, chaff would be dispensed on about half of the sorties to ranges. When chaff is used, about 80 pounds of chaff would be dispensed during the course of the sortie. Chaff would be used only in authorized areas.

2.1.4.4 NTC Site-Specific Components

While most construction requirements for the NTC are similar for both sites (West Otero Mesa and Tularosa Basin), there is a significant difference in the extent of the area that would be disturbed (see Section 2.1.4.3) due to the need to clear UXO in the Tularosa Basin NTC. There are also some significant operational use differences between the two training options.

West Otero Mesa Training Option. The West Otero Mesa site meets or exceeds all operational criteria for a new training site, and is the preferred option. The terrain allows a smaller TFR pattern than the Tularosa Basin site, which translates to more training passes per sortie. Students would be able to complete a full eight-event training profile and return to Holloman with sufficient fuel. The West Otero Mesa site may be approached from any direction without compromising student training or safety in the "pop-up" pattern. The West Otero Mesa site would allow concurrent operations with most Army operations on their Tularosa Basin impact areas, thus minimizing scheduling problems or interruption in either Air Force or Army training. The West Otero Mesa site can be accessed via an existing unimproved road network.

Construction activities within the West Otero Mesa impact area would result in the disturbance of approximately 20 percent of the site (1,024 acres), based on Air Force experience at the Red Rio impact area. Two stock watering troughs are present, within the West Otero Mesa impact area. In addition, a water pipeline serving wildlife and livestock watering stations in the area passes through the site. These features would be relocated outside the impact area. The probability of UXO being present at this site is considered slight. If UXO were determined to be present, appropriate removal and disposal actions would be required (see the Tularosa Basin training option discussion below).

While access to the West Otero Mesa site would be by existing roads, improvements to 15 miles of these roads would be required. These improvements would include smoothing and grading, construction of runoff diversion features, and vehicle turnarounds. Specific design of these improvements has not been accomplished for the West Otero Mesa site. For analytical purposes, it is assumed that 80 acres, some of which is already in use, would be redisturbed during these improvements. Total area disturbed at McGregor Range under this option is estimated at 1,104 acres. Road construction at this site would require about 29,000 cubic yards of gravel.

Tularosa Basin Training Option. The Tularosa Basin site is located at the base of an escarpment forming the western edge of Otero Mesa. This escarpment limits the delivery patterns which can be flown to this site in two ways. First, the escarpment limits the attack flexibility of the range targets. Aircraft cannot attack targets heading directly at the escarpment and safely recover the aircraft after weapons delivery. Students would not be able to attack targets from the high ground of the mesa since the escarpment would require an abbreviated pop-up maneuver, forcing unsuitably short times for the student to visually acquire the target and adjust aircraft flight parameters for an accurate and safe weapons delivery. The second effect of the escarpment is limitations on the TFR pattern. After a TFR delivery, TFR aircraft will turn off target into rising terrain. For student safety, the TFR pattern has been planned to fly up onto the mesa, and down from the mesa at locations with less severe terrain elevation changes. This nonstandard pattern would lengthen the nonproductive time on each TFR pass, cutting student training by approximately two patterns or 25 percent. The Tularosa Basin site would require Army and Air Force training schedules to be deconflicted. The Army uses the Tularosa Basin site as a live ordnance impact area and safety fan for the Short-Range Air Defense (SHORAD) site as well as small arms ranges. These activities are incompatible with flying operations and would have to be separated.

The Tularosa Basin site is located within the existing impact area for various weapons testing and training activities on McGregor Range. The area is contaminated with debris from past missile activities and unexploded live ordnance from anti-aircraft and other artillery training activities. The site has been closed to public access since its withdrawal. No cleanup activities have been previously carried out in this area. In order to develop a target complex on this site, the affected area would have to be decontaminated. To do this, the area would be surveyed for UXO. Any detected UXO would be excavated and rendered safe or detonated in place by qualified explosive ordnance disposal (EOD) personnel. Scrap metal would then be removed and disposed of through the Defense Reutilization and Marketing Office (DRMO). It is assumed that the UXO survey and subsequent cleanup activities would result in major soil disturbance over the entire 5,120-acre area to a depth of up to two feet. This activity would include the complete removal of all vegetation within the two by four-mile Tularosa Basin impact area.

While the Tularosa Basin site, like the West Otero Mesa site, would be used only for inert ordnance, it is possible that the continuing Army weapons testing and training activities in the impact area could result in future contamination of the site by UXO.

Because of this potential for UXO to be present even after site decontamination, site maintenance activities would differ from those described for the NTC in general. At this time, specific maintenance procedures have not been developed for the Tularosa Basin site.

Access to the Tularosa Basin site would require improvement of the existing road network. Improvements would primarily include smoothing and grading, and the construction of runoff features and vehicle turnarounds for existing roads, although some new road construction would also be required. Specific design of these improvements has not been performed. For analytical purposes, it is assumed that 80 acres, some of which is already in use, would be disturbed during these improvements. Total area disturbed at McGregor Range under this option is estimated at 5,200 acres. Road construction at this site would require about 11,000 cubic yards of gravel

2.1.4.5 Components Unique to the Existing Range Training Option

Activities necessary to implement this option are, for the most part, identical to those described for the proposed action in general. The primary difference for this option is that an NTC would not be constructed, and that existing ranges would be used exclusively for air-to-ground weapons training. As a result, airspace use under this option would differ from that described for the NTC training options. Sorties that would have been directed toward a new target complex under the NTC training options would, instead, be directed to the existing ranges and target complexes of WSMR and Melrose Range. However, the Red Rio and Oscura target complexes are not suitable for the basic course TFR patterns. The TFR pattern must be flown over terrain with a maximum elevation change of 1,000 feet for six miles past the target and must allow line-of-sight from an aircraft at 200 feet AGL for 10 miles prior to the target. Neither the Red Rio nor Oscura target complexes provide terrain to meet these requirements. The only range within 180 NM radius of Holloman AFB that meets these requirements is Melrose Range. Melrose Range is 160 NM from Holloman AFB; this distance limits the amount of fuel a student crew has for range training. Flying to a range near the maximum training radius limits the student to one or two TFR patterns and no other training deliveries. Since a normal syllabus sortie includes up to eight delivery events, students operating on Melrose Range would receive 25 percent or less of the desired level of range training experience.

Even if Oscura and Red Rio could be used to meet all the needs of the additional 30 Tornados, a capacity shortfall of about 1,200 sorties would be expected. To accommodate this shortfall, changes in scheduling, range use, and student training would be required. Specifically, the range operation hours would be extended, with more training sorties flown at night, a reduction in on-range time per sortie, and increased reliance on ranges beyond the desired flying distance. The increased reliance on WSMR target complexes and Melrose Range would result in changes in other airspace use as well (Table 2.1-12). These changes would require the GAF to conduct part of the planned training elsewhere. Munitions expenditure under this training option would be as shown in Table 2.1-13. Table 2.1-14 shows the airspace

Table 2.1-12. Proposed Airspace Use Under the Existing Range Training Option

	Sorties within MOAs											
	Beak A		Beak B		Beak C		Talon		Pecos High		Pecos Low	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N
A-10												
AV-8												
T-38	182		182		182		343					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	966	4				
F-16	25		25		25		1		2740	60	3970	80
F-18	20	8	20	8	25		18					
F-117												
HH-53												
HH-60												
Other												
Tornado	209	17	209	17	209	17	1199	14	67	4	67	4
TOTAL	714	30	703	29	661	21	2527	18	2891	64	4135	84

	Air-to-Air Sorties within Restricted Areas									
	R-5107 Lava East/West		R-5107 Mesa High		R-5107 Mesa Low		R-5107 Yonder		R-5103 McGregor High	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10										
AV-8	4		4		4					
T-38	34		49		1		63		97	
B-1										
B-52										
C-130										
F-4	947	32	1014	32	963	32	310		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F-117	4048	800	4048	800						
HH-53										
HH-60										
Other	14	4	10		10					
Tornado	620	20	195	7	679	19	72	5	68	9
TOTAL	6162	904	5812	871	2155	83	459	5	399	9

	Air-to-Ground Sorties within Restricted Areas									
	R-5107 Red Rio		R-5107 Oscura		R-5103 McGregor Low		R-5103 NTC		R-5104/5 Melrose	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10	240		22		22					
AV-8										
T-38										
B-1									48	4
B-52									82	3
C-130										
F-4	94		110		331				10	
F-16	410	50	372	156					7398	822
F-18										
F-117	4015	1018	200	10					144	49
HH-53	120	30	115	10						
HH-60	31	46	46	69					7	18
Other	24	4							17	2
Tornado	667	3	1523	7	480				1462	135
TOTAL	5601	1151	2388	252	833				9168	1033

	Sorties along MTRs																					
	VR-100/125		VR-176 Short		VR-176 Long		IR-102 Short		IR-102 Long		IR-113		IR-133		IR-134/195		IR-141 Short		IR-141 Long		IR-192/194	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
A-10		2					2				4				8		6		1			
AV-8																						
T-38	1						2								4		5	1	1			
B-1							7		2								17		4			
B-52							4		1								11		3			
C-130			225		25																	
F-4			36		4		7						52		25		20				21	
F-16	1036	116	630		70		10		2		518	58			8		22		6			
F-18	8						2		1								5	1	1			
F-117																						
HH-53																						
HH-60																						
Other			45		5		10		5				2		7		26	4	5			
Tornado	401		1301		75		47	2	25	1	1064	135	1417	16	101	2	116	4	40	1	79	1
TOTAL	1446	118	2237		179		91	2	36	1	1586	193	1471	16	153	2	228	10	61	1	100	1

Table 2.1-13. FY95 and FY00 Munitions Use for the Existing Range Training Option

Designator	Type	Oscura			Red Rio			Existing McGregor Target			New Target Complex			Melrose Range		
		FY95	FY00	ERO	FY95	FY00	ERO	FY95	FY00	ERO	FY95	FY00	ERO	FY95	FY00	ERO
2.75 in	Rocket, Inert	50	50	50	100	100	100	0	0	0	0	0	0	0	0	0
2.75 in	Rocket, WP	50	50	50	100	100	150	0	0	0	0	0	0	0	0	0
20 mm	TP	90,000	90,000	92,264	3,348	3,348	3,348	0	0	0	0	0	0	53,400	150,000	150,000
27 mm (DM-38)	TP/TPT	0	0	38,638	0	4,320	9,554	0	0	0	0	0	0	0	0	4,818
30 mm	TP	15,000	15,000	15,000	15,000	15,000	15,000	0	0	0	0	0	0	0	0	15,000
40 mm	TP	10,000	10,000	10,000	10,000	10,000	10,000	0	0	0	0	0	0	0	0	0
50 cal	TP/TPT/AP	47,586	47,586	47,586	142,758	142,758	95,172	0	0	0	0	0	0	0	0	0
7.62 mm	TP/TPT	535,941	535,941	535,940	1,607,821	1,071,881	1,071,881	0	0	0	0	0	0	0	0	0
BDU-33	SSPM	20,160	16,160	22,578	14,112	13,600	15,206	6,048	2,534	2,534	0	0	0	42,724	39,496	42,696
MK-106 (GAF DM-18)	SSPM	0	625	1032	200	438	1,303	450	188	200	0	0	0	22,010	11,585	14,785
BDU-50	Inert	0	0	643	724	724	1859	0	0	0	0	0	0	1,229	1053	745
GBU-10	Inert	0	0	0	33	33	33	0	0	0	0	0	0	97	50	50
GBU-12	Inert	0	0	0	262	262	262	0	0	0	0	0	0	307	120	120
GBU-27	Inert	0	0	0	3	3	3	0	0	0	0	0	0	0	0	0
GBU-10	Live	0	0	0	20	9	9	0	0	0	0	0	0	0	0	0
GBU-12	Live	0	0	0	20	20	20	0	0	0	0	0	0	0	0	0
GBU-27	Live	0	0	0	23	23	23	0	0	0	0	0	0	0	0	0
MK-82, Matra	Live	0	0	0	144	500	1,953	0	0	0	0	0	0	0	0	0
LUU 2	Flares, Illum.	20	20	20	30	30	30	0	0	0	0	0	0	0	0	20
MJ-10	Flares, SP	1,000	1,000	1,000	1,500	1,500	1,500	0	0	0	0	0	0	0	0	1,000
MJ-206	Flares, SP	1,000	1,000	1,000	1,500	1,500	1,500	0	0	0	0	0	0	0	0	0
MJU-7	Flares	2,250	2,250	7,000	20,250	20,250	12,625	0	0	0	0	0	0	1,600	2,000	2,000
MK-24	Flares, Illum.	20	20	20	30	30	30	0	0	0	0	0	0			20
RR-170	Chaff	0	0	0	0	0	0	0	0	0	0	0	0	8,580	7,000	7,000
RR-188	Chaff	0	0	0	734	734	734	0	0	0	0	0	0	5,841	20,000	20,000

AP: Armor-Piercing
Illum: Illumination
SP: Self-Protection
SSPM: Subscale Practice Munition
TP: Target Practice
TPT: Target Practice Tracer
WP: White Phosphorus
ERO: Existing Range Option

Table 2.1-14. Proposed Airspace Use Under the Existing Range Training Option if the ALCM/Talon is not Implemented

	Sorties within MOAs											
	Beak A		Beak B		Beak C		Talon		Pecos High		Pecos Low	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N
A-10												
AV-8												
T-38	182		182		182		343					
B-1									48		58	
B-52									36		40	
C-130												
F-4	278	5	267	4	220	4	888					
F-16	25		25		25		1		2740	60	3970	80
F-18	20	8	20	8	25		18					
F-117												
HH-53												
HH-60												
Other												
Tornado	209	17	209	17	209	17	50		67	4	267	4
TOTAL	714	30	703	29	661	21	1300		2891	64	4335	84

	Air-to-Air Sorties within Restricted Areas									
	R-5107 Lava East/West		R-5107 Mesa High		R-5107 Mesa Low		R-5107 Yonder		R-5103 McGregor High	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10										
AV-8	4		4		4					
T-38	34		49		1		63		97	
B-1										
B-52										
C-130										
F-4	947	32	1014	32	963	32	379		234	
F-16	470	48	465	32	471	32	12			
F-18	25		27		27		2			
F-117	4048	800	4048	800						
HH-53										
HH-60										
Other	14	4	10		10					
Tornado	920	20	195	7	879	19	572	19	68	9
TOTAL	6462	904	5812	871	2355	83	1028	19	399	9

	Air-to-Ground Sorties within Restricted Areas									
	R-5107 Red Rio		R-5107 Oscura		R-5103 McGregor Low		R-5103 NTC		R-5104/5 Melrose	
Aircraft	D	N	D	N	D	N	D	N	D	N
A-10	240		22		22					
AV-8										
T-38										
B-1									48	4
B-52									82	3
C-130										
F-4	94		110		331				10	
F-16	410	50	372	156					7398	822
F-18										
F-117	4015	1018	200	10					144	49
HH-53	120	30	115	10						
HH-60	31	46	46	69					7	18
Other	24	4							17	2
Tornado	667	3	1523	7	480				1462	135
TOTAL	5601	1151	2388	252	833				9168	1033

	Sorties along MTRs																					
	VR-100/125		VR-176 Short		VR-176 Long		IR-102 Short		IR-102 Long		IR-113		IR-133		IR-134/195		IR-141 Short		IR-141 Long		IR-192/194	
Aircraft	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
A-10		2									4		4		8						1	
AV-8																						
T-38	1												3		5						1	1
B-1													7		5						5	
B-52													5		5						4	
C-130			225		25								4		1						1	1
F-4			36		4								58		32						28	
F-16	1036	116	630		70						518	58	10		13						5	
F-18	8												4		1						1	1
F-117																						
HH-53																						
HH-60																						
Other			45		5								14		10						3	2
Tornado	401		836		554						1064	135	1462	16	158	2					136	4
TOTAL	1446	118	1772		658						1586	193	1571	16	238	2					185	9

use under the Existing Range training option if the ALCM/Talon action is not implemented.

2.2 NO-ACTION ALTERNATIVE

Under the No-Action alternative, the GAF would not beddown 30 additional Tornado aircraft at Holloman AFB. Airspace use would remain unchanged over baseline conditions. Other previously authorized actions (see Section 2.3) would be implemented as planned, resulting in changes in personnel and operations at Holloman AFB as described above for projected baseline conditions.

2.3 ACTIONS CONSIDERED FOR CUMULATIVE IMPACTS

Cumulative impacts are defined as impacts on the environment which result from the incremental impact of a proposed action when added to other past, present, and reasonably foreseeable future actions. CEQ regulations require the scope of an EIS to consider cumulative actions which, when viewed with any proposed action, may have cumulatively significant impacts. For the purposes of this EIS, three types of activities have been identified that may contribute to cumulative impacts. They are:

- Past actions. Past actions produced the conditions that existed at Holloman AFB and in associated airspace in FY95.

- Present actions. Present actions consist of U.S. Air Force approved mission changes in the region of influence (ROI) between FY95 and FY00 at the time of the proposed action to expand GAF operations at Holloman AFB. The past and present actions are reflected in the FY00 baseline.

- Reasonably foreseeable future actions:

  — Recently proposed U.S. Air Force mission changes. Since the publication of the Draft EIS (DEIS), additional actions have been proposed that could affect areas of New Mexico and Texas within the ROI for the proposed action. These additional actions are in the planning stage; detailed descriptions of these actions have not been finalized.

  — Other ongoing or projected military activities in the ROI. These include activities at Fort Bliss, such as those affecting McGregor Range, and the areas of WSMR that are included in the training options.

  — Other nonmilitary activities and plans that also affect areas or resources potentially affected by the training options.

Activities in each of these areas that are included in the cumulative impact analysis are described in the following sections.

2.3.1 U.S. Air Force Approved Mission Changes Implemented Between FY95 and FY00

U.S. Air Force approved mission changes at Holloman AFB and Cannon AFB affect airspace areas proposed to be used under the training options, including Restricted Areas, MOAs, and MTRs. The projected baseline for FY00 includes:

- Beddown of 12 GAF Tornado aircraft at Holloman AFB starting in May 1996. This action was analyzed in the *Final Environmental Assessment, Proposed Beddown of the German Air Force PA-200 and an Additional AT-38 Training Unit at Holloman Air Force Base, New Mexico* (U.S. Air Force, 1993). This action will affect aircraft operations at Holloman AFB, WSMR, Beak and Talon MOAs, and several MTRs, including IR-133, IR-134 modified (which includes IR-192, IR-194, and IR-195), and VR-100/125.

- Replacing 99 PAA F/EF-111 aircraft assigned to the 27th Fighter Wing at Cannon AFB with 54 PAA F-16 aircraft. This action was analyzed in the *Final Environmental Assessment of the Proposed Force Structure Changes and Related Actions at Cannon Air Force Base, New Mexico* (U.S. Air Force, 1995). The transition will be complete in 1998 and will affect operations at Melrose Range, Pecos MOA, VR-100/125, and VR-176, as well as a number of overlapping MTRs.

- Completion of the Taiwanese Air Force Training program at Holloman AFB and deactivation of the 435th Fighter Squadron. This action was analyzed in the *Final Environmental Assessment for The Drawdown of AT-38 Aircraft and Deactivation of the 435 Fighter Squadron at Holloman Air Force Base, New Mexico* (U.S. Air Force, 1997b). Completed in FY97/1, it reduced T-38 operations at Holloman AFB, WSMR, McGregor Range, Beak and Talon MOAs, and several MTRs, including IR-133, IR-134, IR-195, and VR-100/125.

- Consolidation and conversion of six MTRs originally established for ALCM tests to low-level training routes, modifications to Talon MOA, and establishment of a new aerial refueling anchor to support units at Holloman AFB. These actions have been analyzed in *Final Environmental Assessment, Proposed Airspace Modifications to Support Units at Holloman Air Force Base, NM* (U.S. Air Force, 1997a). They include changes in aircraft operations within Talon MOA and IR-102/141 and indirectly affect operations in IR-133, IR-134/195, IR-192/194, and VR-100/125 and VR-176. This action has been approved by the Air Force and is pending FAA approval.

2.3.2 Recently Proposed U.S. Air Force Mission Changes

Holloman AFB and associated airspace are dynamic. Missions change as defense requirements are changed. Several U.S. Air Force mission changes have been proposed since the publication of the DEIS. These actions are independent of the proposed action. These additional actions are in the planning stage; detailed descriptions of these actions have not been finalized. An analysis of these actions,

based on the best currently available information, is included in the cumulative effects analysis in Chapter 5. Each proposed future action will be subject to separate environmental documentation and review as required by NEPA.

- Holloman AFB: The U.S. Air Force has proposed to inactivate the 7th Training Squadron, transferring six of its nine F-117 aircraft to the other squadrons. The remaining three F-117 aircraft are proposed to be placed in attrition reserve, resulting in a reduction of 221 military and 9 civilian authorizations. In addition, the 48th Rescue Squadron would inactivate and remove its six HH-60 helicopters from Holloman AFB, decreasing manpower by 167 military and one civilian authorizations. The 4th Space Warning Squadron downsizing would result in a reduction of 51 military authorizations. Total personnel changes at Holloman AFB under these actions is projected to be a reduction of 449 personnel.

- Cannon AFB: The U.S. Air Force proposes to swap out 24 F-16 Block 40 aircraft with 24 F-16 Block 30 aircraft. In addition, the U.S. Air Force has proposed to beddown 12 Block 52 F-16 aircraft in support of international training support activity. These aircraft are expected to use some of the same airspace as the proposed action.

- Realistic Bomber Training Initiative (RBTI): The U.S. Air Force has proposed changing existing military airspace and developing small emitter and scoring site facilities in support of B-1 and B-52 bomber aircrews from Dyess AFB and Barksdale AFB. This would allow the aircrews to conduct realistic, integrated training, allowing for the necessary variability that could be encountered in actual combat. Some airspace proposed for use in the RBTI is the same airspace considered under the proposed action.

2.3.3 Other Continuing and Reasonably Foreseeable Military Actions at WSMR and Fort Bliss

2.3.3.1 White Sands Missile Range

WSMR is part of DOD's Major Range and Test Facility Base and has as its primary mission the support of missile and rocket systems RDT&E. WSMR also supports other RDT&E programs by the U.S. Air Force, Navy, and National Aeronautics and Space Administration (NASA). WSMR has a land area approximately 100 miles long and 40 miles wide that includes numerous laboratories, facilities, test areas, and missile launch sites.

WSMR prepared the *White Sands Missile Range Range-Wide Environmental Impact Statement* (WSMR, 1995) which identified and analyzed ongoing and projected test programs and other missions anticipated to occur at WSMR and within WSMR airspace. These include:

- Air-to-air and air-to-surface missile programs. These include projects that test missiles, such as the Advanced Medium-Range Air-to-Air Missile (AMRAAM), launched from aircraft against targets in the air or on the ground. On average, about 200 missions are conducted annually. Typical tests include captive carry, during which the missile remains attached to a carrier aircraft, and hot firings.

- Surface-to-air missile programs. On average, about 700 surface-to-air missile missions are conducted at WSMR annually. These include development and flight testing of the Extended Range Intercept Technology (ERINT) interceptor missile, testing of Forward Area Air Defense System (FAADS) which uses the Stinger ~~missiles~~, and test firing and tracking of Phased-Array Tracking to Intercept of Target (PATRIOT) missiles.

- Surface-to-surface missile programs. On average, 250 surface-to-surface missions are conducted at WSMR annually. These include test launches of the Army Tactical Missile System (ATACMS) solid-propellant missiles from Multiple Launch Rocket System (MLRS) launchers (including high explosives tests in approved areas), flight tests and fire control tests of the solid-propellant Line-of-Sight Anti-Tank (LOSAT) missile, and testing of new propulsion systems for 13mm and 20mm guns.

- Testing of drone target systems. On average, 400 missions are conducted annually of target systems for Stinger, and Homing All the Way to Kill (HAWK) missile programs.

- Theater High-Altitude Air Defense (THAAD) program.

- NASA and space program support. On average, 400 NASA and space program missions are conducted annually at WSMR, including the Space Shuttle program, shuttle training aircraft, and Single-Stage Rocket Test program. WSMR is an alternate landing site for the space shuttle. Laboratories at NASA's White Sands Test Facility (WSTF) test the compatibility of materials being considered for use in aerospace applications. The WSTF's tracking and data relay system station provides satellite data relay services to spacecraft such as the shuttle. NASA operates and maintains a shuttle training aircraft that provides a realistic simulation of the shuttle landing from 35,000 feet to touchdown. The Single-Stage Rocket Test Program is a U.S. Army Ballistic Missile Defense Organization program to develop a vertically launched and recoverable suborbital rocket capable of lifting up to a 3,000-pound payload and returning to the launch site for a precise, soft, vertical landing. WSMR is providing preflight static testing, hover flight, and rotation flight tests for this program.

- Equipment components and subsystem tests. On average, 300 such tests are performed at WSMR annually and typically include flight testing on helicopter or fixed-wing aircraft.

- High-energy laser missions. On average, 100 high-energy laser missions are conducted annually at various approved locations on WSMR.

- Research and development programs, primarily in nuclear effects (conducted in simulated environments) and research rockets (e.g., sounding rockets).
- Special tasks, normally consisting of small-scale training exercises, indoor testing, field tests, and EOD.
- Supersonic flights over WSMR. Approximately 2,900 sorties having the potential for a supersonic occurrence take place below FL300 within the high-altitude supersonic area and the low-altitude supersonic test corridor. Renewal of an existing waiver is needed to continue conducting these flights. The NEPA aspects of this proposed action are being addressed through the Environmental Assessment process (U.S. Air Force, 1997c).
- Theater Missile Defense Initiative (TMDI). The TMDI is a proposed action that would, in part, use WSMR. Missiles launched from WSMR, Fort Wingate Depot Activity Launch Area, or Green River Launch Complex would be intercepted by defensive missiles over WSMR (U.S. Air Force, 1994a).

In addition, WSMR supports air-to-ground training at Red Rio and Oscura target complexes and air-to-air training in its Restricted Areas. These activities are included in the baseline operations identified for those areas.

2.3.3.2 Fort Bliss

Fort Bliss is comprised of various facilities located adjacent to the City of El Paso, Texas and three main range areas. Adjacent to El Paso are the Main Cantonment Area, Biggs Army Airfield, William Beaumont Army Medical Center, and Logan Heights. The ranges include the South Maneuver Area, which extends from the Main Cantonment Area to the New Mexico border, and the Doña Ana/North Maneuver Area and McGregor Ranges in New Mexico. The primary mission of Fort Bliss is the Army Air Defense Artillery Center, which supports four Air Defense Artillery (ADA) Brigades. The 3rd Armored Cavalry Regiment (ACR), formerly located at Fort Bliss, was relocated to Fort Carson. This relocation changed the focus of Fort Bliss training from armored vehicle maneuvers to air defense. The main range activities performed at Fort Bliss include:

- Classroom and field training of U.S. Army and allied ADA units. This includes both simulated and live-fire training with HAWK and PATRIOT missile systems.
- Army Test and Experimentation Command ADA testing and other test programs and expansion.
- Marine Corps HAWK training.
- Exercises such as Roving Sands Joint Training Exercise.

The portion of Fort Bliss that could experience cumulative impacts in combination with the training options is McGregor Range. McGregor Range is a multi-weapons range that includes two specialized ranges: the SHORAD Range and the Meyer

Range small arms training complex. McGregor also contains the Orogrande Range, Wilde Benton landing zone (8,000-foot dirt strip), helipads, and the Meyer and McGregor Range Camps. The majority of McGregor Range consists of impact areas and associated safety areas for ADA missile firings. Specific elements of McGregor Range include:

- Fourteen static ADA missile launch sites (six PATRIOT and eight HAWK) and 25 field sites.
- Four MLRS firing sites for extended range firings into southern McGregor Range impact areas.
- SHORAD Range with 16 firing points for FAADS weapons systems and combined arms operational testing.
- A Class C air-to-ground target used by the U.S. Air Force.
- Aerial target training area for Stinger weapons system training using towed and remote control aerial targets.
- Helicopter tactical flight training and gunnery, including six nap-of-the-earth helicopter training courses.
- The Cane Cholla Helicopter Gunnery Range for training with Hellfire and Tube-launched, Optically tracked, Wire-guided (TOW) missiles, 2.65 inch rockets, and 20mm, 40mm, and 7.62mm ammunition.
- An ATACMS launch site for launching into WSMR.
- Orogrande Range with 12 firing points used primarily for operational ADA tests.
- Two drop zones.
- Small arms training at pistol, machine gun, hand grenade, and demolition ranges in the Meyer Range complex.
- McGregor Range base camp and adjacent Davis Dome, which provide range control and have the capability to mess and billet up to 1,100 transient personnel.

Fort Bliss has published a Notice of Intent (NOI) to prepare an EIS to address its ongoing mission and improvements projected in its Installation Real Property Master Plan. Specific elements of Fort Bliss proposed activities at McGregor Range have not yet been published, but activities currently identified include:

- Development of an Air Defense Center of Excellence. This will involve expanded training on McGregor Range to support the four ADA brigades stationed at Fort Bliss. Providing adequate training opportunities for these units may require an increase in approved ADA sites. Training units travel to and from these sites along existing roadways on the range.
- Continued support of Roving Sands Exercises. This exercise is usually conducted annually in the April-May time frame. It is the largest ADA exercise in the

world and has historically involved between 10,000 and 20,000 participants, most of whom are located in the Main Cantonment Area and Logan Heights. Typically, about 6,000 participants are deployed at field locations on Doña Ana and McGregor Ranges. HAWK and PATRIOT missile systems are deployed on up to 25 (20 PATRIOT and five HAWK) sites at McGregor Range. The exercise, which lasts about a month, culminates in a one-week live fly period, during which about 2,400 sorties are flown between the Roswell area and WSMR by U.S. Air Force, Navy, Marines, and allied forces participating in the exercise. At the peak of the exercise, as many as 400 sorties a day are flown in the region.

- Live-fire exercise following Roving Sands. Although not a part of Roving Sands itself, the exercise is typically followed by a two to three-day live-fire exercise involving the ADA participants. Several dozen PATRIOT and HAWK missiles are fired at flying target profiles above the established impact areas in the Tularosa Basin portion of McGregor Range.

- Continued support of the Japanese Annual Service Practice. Typically scheduled in November, the Japanese Annual Service Practice involves deploying HAWK and PATRIOT missile units on McGregor Range. In 1996, the Japanese deployed 17 HAWK units, each of which fired a missile, and 24 PATRIOT units, which fired a total of 30 missiles into the existing impact area. This program is anticipated to be expanded to incorporate training with Stinger missiles.

- Continued support of the Aerostat test bed to provide over-the-horizon surveillance during exercises such as Roving Sands. The Aerostat is a radar surveillance system mounted on a tethered blimp at an altitude of approximately 25,000 feet MSL.

Fort Bliss has published an NOI to prepare an EIS that addresses McGregor Range land withdrawal renewal by Congress in accordance with PL 99-606.

2.3.4 Continuing and Reasonably Foreseeable Nonmilitary Actions

There are several nonmilitary actions that are planned in the vicinity of Alamogordo.

- Alamogordo Relief Route. Local traffic flow in and around Alamogordo will be upgraded by the Alamogordo Relief Route. The four-lane bypass will connect U.S. 54/U.S. 70 at the U.S. 82 intersection north of Alamogordo with the U.S. 54/U.S. 70 split south of Alamogordo. This west side bypass will relieve traffic congestion on White Sands Boulevard.

- Alamogordo Schools. The citizens of the city of Alamogordo recently approved (February 1998) a $14 million bond issue to support various school system projects. These projects include: renovating the old Mid-High (referred to as the Hawaii complex project); upgrading the Alternative High School; upgrading the Chaparral facility; and constructing a new middle school.

- Gerald Champion Memorial Hospital. The Alamogordo city commission unanimously agreed to issue $17.5 million of industrial revenue bonds in support of the Gerald Champion Memorial Hospital. The commission previously (March 1997) approved the needed property rezoning. The Air Force has endorsed a plan to merge the hospital at Holloman AFB with this new facility.
- Wal-Mart. The Wal-Mart Corporation has purchased property in Alamogordo to construct a "supercenter" Wal-Mart store. The 203,743 square foot facility is projected to be completed by the end of 1998.
- Ongoing activities on public lands. Public lands, including U.S. Forest Service (USFS) and Bureau of Land Management (BLM) lands, will have continued grazing, timber harvesting, wood gathering, recreation, and other multiple uses as permitted by the land manager.

2.4 COMPARISON OF IMPACTS

Chapter 4.0 presents an analysis of the impacts due to each training option and due to the No-Action alternative. Table 2.4-1 provides a summary of these impacts.

2.5 PERMIT AND CONSULTATION REQUIREMENTS

Implementation of one of the training options may require various regulatory compliance actions. Several such compliance actions that might be required are discussed below.

Threatened and Endangered Species Consultation. The U.S. Air Force and U.S. Fish and Wildlife Service (USFWS) are currently in formal consultation under Section 7 of the Endangered Species Act regarding the proposed action. The U.S. Air Force contacted USFWS regarding the proposed action on August 20, 1996. USFWS responded (September 10, 1996) by designating the USFWS New Mexico Field Office, Albuquerque, as the USFWS point of contact for information transfer and any consultations. A meeting among U.S. Air Force, USFWS, and Fort Bliss Environmental Directorate staff was held October 3, 1996 to discuss the proposed action and USFWS concerns. Follow-on meetings were held in April and October 1997, and January 1998. During these meetings, USFWS indicated that the protected and sensitive species of most concern on McGregor Range and under associated restricted airspace (R-5103) include aplomado falcon, peregrine falcon, bald eagle, mountain plover, black-footed ferret, Western burrowing owl, Baird's sparrow, black-tailed prairie dog, Texas horned lizard, loggerhead shrike, bats, night-blooming cereus, and grama grass cactus. Species of most concern to USFWS within the MOAs and MTRs include bald eagle, peregrine falcon, aplomado falcon, Mexican spotted owl, Southwestern willow flycatcher (VR-176 only), Mexican gray wolf (VR-176 only), jaguar (VR-176 only), and the experimental population of whooping cranes (VR-176 only). If selected, the proposed action would not

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

	Proposed Action					
Resource	Impacts Common to All Training Options	Impacts Common to Airspace for NTC Training Options	West Otero Mesa NTC Training Option	Tularosa Basin NTC Training Option	Existing Range Training Option	No-Action Alternative
Airspace Use and Management	Minor impact to civil aircraft operations from increased operations at Holloman AFB.	No effects to airspace structure or private/commercial use of airspace would result from changes in and continued use of airspace. Increases in sortie levels on all airspace are considered insignificant in terms of airspace management.	No impact over and above that common to the NTC training options.	No impact over and above that common to the NTC training options.	No effects to structure or private/ commercial use of airspace from increased use of airspace. Increases in sortie levels on all airspace are considered insignificant in terms of airspace management.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.
Noise	Area within a 65 dB contour around Holloman AFB would increase about 5 square miles (12%) over the FY95 total area covered of 40.5 square miles.	Cumulative L_{dnmr} would range between 35 and 63 dB in existing airspace. Highest noise levels would occur under Red Rio, Oscura, Melrose Range, McGregor Range, Talon Low MOA, IR-133, IR-134/195, and IR-192/194.	L_{dnmr} would range between 35 and 80 dB on the NTC.	L_{dnmr} would range between 35 and 80 dB on the NTC.	On Melrose Range, sound levels would range between 35 and 80 dB. L_{dnmr} would range between 35 and 64 dB in existing airspace, with the MTR and MOA high being 61 dB. Highest noise levels are located under Red Rio, Oscura, McGregor, and Melrose.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action					No-Action Alternative
	Impacts Common to All Training Options	Impacts Common to Airspace for NTC Training Options	West Otero Mesa NTC Training Option	Tularosa Basin NTC Training Option	Existing Range Training Option	
Land Use	No new impact would result from the 96 acres of construction, since it would be in areas designated for same use. Noise increases mainly over undeveloped and Clear Zones would result in negligible impact. Noise level increases of 1-3 dB would occur over residential areas on southeast side of cantonment. Off-base noise levels greater than 65 dB would increase by 3.6 square miles. This would include off-base private land and WSNM. May affect alternative sites for a new campground on WSNM. Grazing impacts similar to current conditions.	Increased overflights and resulting noise in airspace would generally not result in appreciable increases in noise. Therefore, impacts would generally be low or negligible, and compatible with existing land uses. Potential impacts would include infrequent startling or annoyance of people and domestic animals from 1 to 7 dB in some locations under the MOAs, MTRs, and Restricted Area. Noticeable increases, in the 5 to 7 dB range, would occur over select areas of Otero, Eddy, Hudspeth, and Culberson counties. Impacts would be minimal on these areas because they are in areas of low population; however, increased disturbance of people in isolated residences and recreational and wilderness users would occasionally occur.	Public activities would be excluded from the 5,120-acre impact area. This would result in about 2% loss of current grazing land on McGregor Range. This is less than 0.2% of AUMs available on BLM lands in Otero County. Hunting access would also be excluded from the 5,120-acre impact area. Access to McGregor Range by recreationists, BLM workers, and livestock producers would be reduced on weekdays, potentially creating scheduling problems for livestock operations in safety footprints. Use of the NTC would result in increased overflights of Culp Canyon and the grassland ACECs on McGregor Range. These overflights would not affect land use of these areas.	Public access to the NTC site would not change because the NTC would be in an area currently closed to the public. Use of this NTC would not affect grazing leases.	Land use impacts under MOAs and MTRs generally would be similar to the NTC options. Use of VR-176 Short and IR-113 would double and triple in use, respectively, compared to the NTC options.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action					No-Action Alternative
	Impacts Common to All Training Options	Impacts Common to Airspace for NTC Training Options	West Otero Mesa NTC Training Option	Tularosa Basin NTC Training Option	Existing Range Training Option	
Air Quality	Annual emissions (CO, NO_x, SO_x, VOC, PM) would increase from construction at Holloman AFB or on WSMR, Holloman AFB take-offs/landings, facility use, and traffic. Increases would have insignificant impacts on air quality conditions. Emissions would not contribute to any exceedance leading to nonconformance with EPA's Conformity Rule or the CAA. There would be no impact to visibility.	Annual emissions (CO, NO_x, SO_x, VOC, PM) would increase from aircraft sorties on airspace. Increases would have insignificant impacts on air quality conditions. Emissions would not contribute to any exceedance leading to nonconformance with EPA's Conformity Rule or the CAA. There would be no impact to visibility.	Emissions (CO, NO_x, SO_x, PM, VOC) would increase from construction of the NTC. Impacts may be locally significant but would be short-term and temporary. Therefore, increases would have insignificant impacts on annual air quality conditions. Emissions from aircraft sorties over and immediately around the NTC would not affect ambient air quality and would not contribute to any exceedance leading to nonconformance with EPA's Conformity Rule or the CAA. There would be no impact to visibility.	Construction emissions would be higher at the Tularosa Basin site compared to the West Otero Mesa site due to greater site cleanup requirements. Impacts may be locally significant but would be short-term and temporary. Therefore, increases would have insignificant impacts on annual air quality conditions. Air emissions from operations and site maintenance would be similar to those under the West Otero Mesa NTC option.	No emissions would be generated related to construction of targets. Minor emissions (mainly PM) would result from maintenance of existing ranges. Annual emissions (CO, NO_x, SO_x, VOC, PM) would increase from aircraft sorties. Increases would have insignificant impacts on air quality conditions. Emissions would not contribute to any exceedance leading to nonconformance with EPA's Conformity Rule or the CAA. There would be no impact to visibility.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action: Impacts Common to All Training Options	Proposed Action: Impacts Common to Airspace for NTC Training Options	Proposed Action: West Otero Mesa NTC Training Option	Proposed Action: Tularosa Basin NTC Training Option	Proposed Action: Existing Range Training Option	No-Action Alternative
Biological Resources	Loss of 96 acres of poor quality vegetation and habitat at Holloman AFB including about 15 acres of relatively undisturbed desert scrub habitat. Loss of bat roost in existing building to be demolished. No impacts to protected and sensitive species or wetlands and Waters of the U.S. Existing and potential Western burrowing owl nest burrows may be affected by construction. Minimal impacts to Waters of the U.S. at Holloman AFB. Less than 10 acres of vegetation along existing roads would be lost during installation of fiber-optic cable and TOSS on WSMR.	Small increase of area and vegetation disturbed on existing ranges, primarily on Red Rio (about 3.4 acres), with Oscura and Melrose disturbance being substantially less. Negligible impact to wildlife and protected/ sensitive species on ranges from changes in flare and inert ordnance use. Moderate impact to wildlife using Red Rio from vegetation loss due to increased use of live ordnance. No impacts would occur to jurisdictional wetlands. Minimal impacts to Waters of the U.S. at Oscura and Red Rio. Overflights would increase on much of the airspace over FY00 levels. No associated impacts would occur to vegetation, jurisdictional wetlands, or Waters of the U.S. Increased overflights of waterfowl and big game habitat would result in negligible to low impacts. Increased sorties over the NTC would result in low to moderate impacts to wildlife including nesting raptors and potential bat roosts. Impacts to protected and sensitive species from increased overflights would be negligible to low. Potential increased overflights of peregrine falcon and Mexican spotted owl nests would occur on VR-176, IR-134 /195, and	Loss of up to 1,040 acres of vegetation and wildlife habitat to construct, maintain, and use NTC. Fire potential from flare and inert ordnance use would be low. Remaining undisturbed habitat in NTC may be improved because of protection from livestock grazing. Temporary or permanent displacement of wildlife from the 5,120-acre NTC during training and maintenance. Loss of grama grass cactus and habitat. Loss of marginal quality, unoccupied aplomado falcon habitat. Potential loss of burrowing owl and black-tailed prairie dog habitat. Increased overflights of winter bald eagles on McGregor Range. No jurisdictional wetlands would be affected. Up to 46,000 linear feet of Waters of the U.S. may be minimally disturbed.	All 5,120 acres of vegetation and wildlife habitat would be disturbed during ordnance removal and NTC construction. Non-target areas would be reseeded after construction; however, about 20% of the area would remain devoid of vegetation due to use and maintenance. Fire potential from flare and inert ordnance use would be negligible to low. Temporary or permanent displacement of wildlife from the 5,120-acre NTC during construction, training, and maintenance. Loss of night-blooming cereus and habitat. Increased overflights of winter bald eagles and unoccupied aplomado habitat on McGregor Range would occur. No jurisdictional wetlands would be affected. About 33,240 linear feet of Waters of the U.S. would be minimally disturbed.	Overflights would be greatest on IR-113 and VR-176 over FY00 levels. No impacts would occur to vegetation, jurisdictional wetlands, or Waters of the U.S. Increased overflights of waterfowl and big game habitat would result in negligible to low impacts. No additional sorties would be flown over McGregor Range; therefore, impacts to wildlife from overflights would be negligible. Impacts to protected and sensitive species from increased overflights would be negligible to low. Overflights of peregrine falcon and Mexican spotted owl nests would occur on VR-176 at a greater frequency than the NTC options. Use of IR-134/195 and IR-192/194 would be lower compared to the NTC options. Increased overflights of winter bald eagles would occur on VR-176, and VR-100/125 would be greater compared to the NTC options while overflights on IR-192/194 would be less compared to the NTC options. Overflights of unoccupied and low-quality aplomado falcon habitat on McGregor Range would be infrequent compared to the NTC options.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action: Impacts Common to All Training Options	Proposed Action: Impacts Common to Airspace for NTC Training Options	Proposed Action: West Otero Mesa NTC Training Option	Proposed Action: Tularosa Basin NTC Training Option	Proposed Action: Existing Range Training Option	No-Action Alternative
Biological Resources (continued)		IR-192/194. Increased overflights of winter bald eagles would occur on VR-176, VR-100 /125, IR-192/194, and NTC. Unoccupied low-quality aplomado falcon habitat on Otero Mesa would be overflown.				
Archaeological, Cultural, and Historical Resources	No impacts would occur to archaeological, cultural, or historical resources on Holloman AFB, Oscura, Red Rio, or Melrose Range.	Negligible or no impacts to resources from use of existing airspace and ranges.	Of the 22 archaeological sites, 9 sites may be either eligible to be placed on the National Register or their eligibility is undetermined. These 9 sites may be impacted by construction and use of the NTC. Fencing the NTC would reduce access and risk of vandalism.	Of the 46 archaeological sites, 21 sites may be either eligible to be placed on the National Register or their eligibility is undetermined. These sites may be impacted by construction and use of the NTC. Fencing the NTC would reduce access and risk of vandalism.	Negligible or no impacts would occur to archaeological, cultural, or historical resources.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.
Water Resources	Minimal impacts to storm water runoff due to construction or operations at Holloman AFB. Construction of TOSS sites and placement of fiber-optic cables would result in minimal impacts.	No impacts would occur beneath existing airspace. Increased disturbance to existing ranges would have negligible effects on surface water or groundwater resources.	Minimal impacts to Waters of the U.S. due to construction of the NTC. Operational impacts would be negligible. Water resource improvements (pipelines, water tank, pumphouse) may be temporarily damaged by inert ordnance. Repairs would be accomplished rapidly to reduce lost water availability.	Minimal impacts to Waters of the U.S. due to construction of the NTC. Operational impacts would be negligible. Water resource improvements (pipelines, water tank, pumphouse) may be temporarily damaged by inert ordnance. Repairs would be accomplished rapidly to reduce lost water availability.	Increased disturbance of existing ranges would result in negligible impacts to water resources.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action					No-Action Alternative
	Impacts Common to All Training Options	Impacts Common to Airspace for NTC Training Options	West Otero Mesa NTC Training Option	Tularosa Basin NTC Training Option	Existing Range Training Option	
Hazardous Materials and Waste Management	Increased use and storage of hazardous materials would result in negligible impacts. Hazardous waste generation would increase by 10,000 pounds/year (4% increase) over FY00 levels.	Munitions use would increase on existing ranges. Ranges would be cleared periodically of munitions scrap metal which would be disposed of through the DRMO. Therefore, impacts would be negligible.	The NTC would be cleared periodically of munitions scrap metal which would be disposed of through the DRMO. Therefore, impacts would be negligible.	The NTC would be cleared periodically of munitions scrap metal which would be disposed of through the DRMO. Therefore, impacts would be negligible.	Munitions use would increase on existing ranges. Ranges would be cleared periodically of munitions scrap metal which would be disposed of through the DRMO. Therefore, impacts would be negligible.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.
Socio-economics	Increase of 640 personnel at Holloman AFB (5% increase over FY00 levels). About 110 construction personnel would be required. Additional annual wages and purchases in Otero County would increase $31.0 million (18% increase) over FY00 baseline. Additional 750 direct jobs and 197 indirect jobs in Otero County would be generated. No significant impacts to police and fire protection or health care.	No significant impacts to regional socioeconomic attributes.	No significant impacts. Construction costs of NTC would be about $4 million over 1998 and 1999. Net grazing impact would be 0.4% of Otero County agricultural products revenue.	No impacts. Construction costs of NTC would be about $20 million over 1998 and 1999.	No impacts to regional socioeconomic attributes.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.
Transportation	No significant impact	No impacts.	No impacts.	No impacts.	No impacts.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action					No-Action Alternative
	Impacts Common to All Training Options	Impacts Common to Airspace for NTC Training Options	West Otero Mesa NTC Training Option	Tularosa Basin NTC Training Option	Existing Range Training Option	
Utilities	Holloman AFB utility use would, over FY00 baseline, increase 7% for potable water, 12% for wastewater treatment, 13% for electricity, and 6% for natural gas. Holloman AFB solid waste quantities would decrease. The corresponding utility use increases for Alamogordo would be 6%, 6%, 2%, and 5%, respectively. Alamogordo solid waste would increase 3%.	No impacts.	A portion of existing water lines and a stock tank may be relocated. Water lines may be infrequently and temporarily damaged by inert ordnance. Repairs would be accomplished rapidly to reduce lost water availability.	No impacts.	No impacts.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.
Soils	Minimal water and wind erosion would occur to the 96 acres of soil on Holloman AFB and less than 10 acres of soil at the TOSS and fiber-optic construction sites.	Limited additional soil exposure on existing ranges would result from increased ordnance use. Soil erosion increase would be negligible.	About 20% of NTC would be heavily impacted (vegetation removed) during construction. Soil loss during construction, assuming no mitigative measures, would be about 22 tons/acre/yr, and about 1 ton/acre/yr would be formed. Mitigative measures would result in minimal soil loss.	Virtually 100% of the NTC would be heavily impacted (vegetation removed) during ordnance cleanup and construction. Soil loss during construction, asuming no mitigative measures, would be about 62 tons/acre/yr, and about 3 tons/acre/yr would be formed. Mitigative measures would result in minimal soil loss.	Limited additional soil exposure on existing ranges would result from increased ordnance use. Soil erosion increase would be negligible.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

Table 2.4-1. Comparison of Impacts Among the Proposed Action Training Options and the No-Action Alternative

Resource	Proposed Action					No-Action Alternative
	Impacts Common to All Training Options	Impacts Common to Airspace for NTC Training Options	West Otero Mesa NTC Training Option	Tularosa Basin NTC Training Option	Existing Range Training Option	
Safety	Safety impacts would be negligible.	Minimum probable time between Class A mishaps would be similar to minimum probable times for FY00 sortie levels in MOAs and decrease for MTRs and restricted airspace. Bird-airstrike incidence would increase compared to historic levels but increase would be small. No impacts on existing ranges.	Fire potential would increase but would be minimized during construction, training, and maintenance through use of safety and fire suppression precautions. Operation of targeting lasers in combat mode would be limited to targets and target areas. Workers would also be informed and trained to rely on EOD specialists if ordnance is found.	Fire potential would increase but would be minimized during construction, training, and maintenance through use of safety and fire suppression precautions. Operation of targeting lasers in combat mode would be limited to targets and target areas. Workers would also be informed and trained to rely on EOD specialists if ordnance is found.	Minimum probable time between Class A mishaps would be similar to minimum probable times for FY00 sortie levels in MOAs and decrease for MTRs and restricted airspace. Bird-airstrike incidence would increase compared to historic levels but increase would be small. No impacts on existing ranges.	Implementation of the No-Action alternative would result in no change in FY00 baseline conditions. No impact would result.

be implemented until Endangered Species Act issues have been resolved with the appropriate agency.

Migratory Bird Treaty Act Permit. A permit under the Migratory Bird Treaty Act may be required if the proposed action is selected, and new Western burrowing owl nests are found within the Holloman AFB or NTC construction areas. Potential mitigations would be identified as appropriate and may include modifying the specific layout of facilities and construction areas to avoid nests, or constructing artificial nest burrows. Any compliance obligations associated with this act would be resolved with the appropriate agency prior to disturbance of nests and birds.

Clean Water Act Permitting. Several permits would be needed for construction and operations at Holloman AFB, the TOSS sites, and the NTC to ensure compliance with the Clean Water Act (CWA). As shown in Table 2.5-1, the two types of permits that would be needed are the CWA Section 402, National Pollutant Discharge Elimination System (NPDES) permits issued by the EPA and Section 404 Dredge and Fill permits issued by the U.S. Army Corps of Engineers. Table 2-5.2 shows the location-specific CWA permitting. Thus, the proposed action would involve NPDES storm water discharge permitting of construction (Holloman AFB, NTC, and TOSS) and operation (Holloman AFB) activities. The proposed action would also involve Section 404 Dredge and Fill permitting of the Holloman AFB outfall structures, NTC, and TOSS. NPDES permits are required for activities that result in discharge into Waters of the U.S. which may potentially contaminate storm water runoff. Permits are required for storm water runoff from construction activities that disturb greater than five acres. Facility operations that discharge into Waters of the U.S. may also require permitting. In general, for storm water, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared. The SWPPP describes the construction practices, inspections, and other measures that will be employed to prevent pollution of runoff. Steps to be taken include ensuring that contractors use erosion control measures such as water, conveyance, and energy dissipation structures and sediment retention measures such as basins, tarps, and barriers designed to minimize soil movement and reduce impacts resulting from wind or water erosion at disturbed sites. An NOI to discharge would be submitted to EPA for approval and permitting. The role of EPA is to write the general permit, publish it in the Federal Register, and authorize coverage under the permit, as authorized under 40 CFR 122 and Section 402 of the CWA. If an existing permit is applicable, then the new or modified facility would be incorporated under the existing permit through the SWPPP revision and EPA review process. The State of New Mexico must certify (401 certification) that compliance with the Federal permit will adequately protect state water quality. The State of New Mexico water quality levels are addressed in the Standards for Interstate and Intrastate Streams (20 NMAC 6.1) and Water Quality Control Commission Regulations (20 NMAC 6.2). Compliance with these standards and regulations would be achieved through the Federal permits or State discharge plans. A Notice of Termination (NOT) would be submitted to EPA upon completion of construction activities and stabilization of a construction site.

Table 2.5-1. Clean Water Act Permitting

Item	Section 402 Permit	Section 404 Permit
Clean Water Act Requirement	National Pollutant Discharge Elimination System	Permits for Dredged or Fill Material
Regulatory Requirements	40 CFR 122	33 CFR 330
Federal Agency	Environmental Protection Agency	Army Corps of Engineers
Regional/Local Federal Office	EPA Region 6, Dallas	Corps of Engineers Regulatory Office, El Paso
State Responsibility	Inspection (under contract to EPA), 401 Certification*	401 Certification*
Actions Covered	Actions outside Waters of the U.S. that disturb greater than 5 acres or potentially contaminate storm water runoff to the Waters of the U.S.	Actions within Waters of the U.S. that disturb greater than 500 feet of these waters. Special consideration is given to wetlands (characteristic hydrology, vegetation, soils).
Permits	NPDES General Permit for Storm Water Discharges from Construction Sites NPDES Multi-Sector General Permit for Storm Water Discharges from Industrial Activities	Nationwide Permit. Individual action specific permit.
Obtaining Permit Coverage	Prepare SWPPP and submit NOI.	Varies with permit. Consult with COE Regulatory Official.

* Section 401 Certification. The state must certify that compliance with a Federal permit will not result in a violation of state water quality standards or regulations.

Table 2.5-2. Clean Water Act Compliance

Location	Section 402 Permit		Section 404 Permit
	Operations	Construction	
Holloman AFB	NPDES action would be approved under Multi-Sector General Permit for Storm Water Discharges from Industrial Activities and conducted in accordance with the SWPPP.	Individual actions would be specifically approved under the NPDES General Permit for Storm Water Discharges from Construction Sites and conducted in accordance with the SWPPP.	Action would be approved under either Nationwide Permit #7, Outfall Structure, or Nationwide Permit #26, Headwaters and Isolated Waters Discharge.
NTC	Not required.	Individual actions would be specifically approved under the NPDES General Permit for Storm Water Discharges from Construction Sites and conducted in accordance with the SWPPP.	Individual action would be approved under a site-specific permit.
TOSS	Not required.	Individual actions would be specifically approved under the NPDES General Permit for Storm Water Discharges from Construction Sites and conducted in accordance with the SWPPP.	Individual action would be approved under either a Nationwide permit or a site-specific permit.

Operation of the new facilities at Holloman AFB would be covered under the existing Multi-Section General NPDES Permit for Storm Water Discharges from Industrial Sites (September 29, 1995 Federal Register, pp 50804-51319). The existing SWPPP would be modified to ensure that the facilities are covered and operations meet SWPPP requirements. The base SWPPP must be updated at least annually. The new GAF operations would be added during the required annual update of the SWPPP. An NOI would be submitted when permit renewal is required (currently five years) to EPA to gain coverage.Construction sites disturbing more than five acres and potentially discharging storm water to Waters of the U.S. must have authorization under a NPDES General Permit for Storm Water Discharges from Construction Sites. The Federal permits are undergoing revision and, at this writing, construction sites in New Mexico must be covered under the permit published in the September 9, 1992 Federal Register (p. 41176). This permit has been replaced for many parts of the country by a new permit published in the February 17, 1998 Federal Register (p. 7857). However, the latter permit does not cover EPA Region 6, including New Mexico. The revised permit covering New Mexico is expected by June 1998. However, the revised permit is not expected to be significantly different from the February 17, 1998 permit regarding the construction sites considered in this document.

These permits all require the development of a SWPPP describing measures to be taken to prevent pollutants from construction sites from entering the Waters of the U.S. The SWPPP describes standard erosion control practices to be employed during construction to prevent sediments from entering streams both during the construction process and after construction is completed. Measures must be identified to prevent and respond to spills from chemicals used on the site such as fuels, lubricants, and adhesives. An inspection schedule must be developed and each inspection must be documented in the plan as it occurs. The plan must be complete prior to the initiation of construction. Coverage under any National permit is obtained by submitting an NOI not later than 48 hours prior to the start of construction. For the 1992 permit still in effect at this writing, an NOT may optionally be submitted when site stabilization is complete. However, the submission of an NOT is required in the February 17, 1998 permit for other parts of the U.S. and it is anticipated that this requirement will be in the new permit for New Mexico.

Construction actions at Holloman AFB would require SWPPP and NOI preparations and submittals. Implementation of the SWPPPs would ensure that potential impacts would be minimized.

NPDES installation of the TOSS components and the fiber-optic cable would involve disturbing less than 10 acres. This construction would require an SWPPP and NOI to discharge. The TOSS construction sites may be covered by the NPDES General Permit for Storm Water Discharges from Construction Sites (September 9, 1992 Federal Register, pp. 41176-41342.) This permit is now undergoing review and a new permit is expected to be published in the Federal Register by June 1998.

Construction of the NTC would require a SWPPP and submittal of an NOI to discharge since more than five acres would be disturbed. Operations at the TOSS sites and the NTC would not require NPDES permit-driven SWPPP and NOI to discharge submittals.

The Section 404 permits cover actions within Waters of the U.S. that may affect those waters or jurisdictional wetlands. A disturbance threshold of greater than 500 feet of Waters of the U.S. triggers this permit requirement. Section 404 dredge and fill activities can be permitted under either existing nationwide permits or under individual permits prepared by the U.S. Army Corps of Engineers. The application for permit coverage and the determination of permit requirements are made through consultation with the District Engineer of the U.S. Army Corps of Engineers. In addition, the State of New Mexico must certify that compliance with the Federal permit will not result in a violation of State water quality standards or other regulations.

The Section 404 permitting of on-base construction of the storm water outfalls for the open improvements and runway extension would proceed either under the Nationwide Permit #7, Outfall Structures or under the Nationwide Permit #26, Headwaters and Isolated Waters Discharge (33 CFR 330).

The Section 404 permitting of the construction of the TOSS system could probably be done either under the Nationwide Permit #12, Utility Line Discharges, or under the Nationwide Permit #26, Headwaters and Isolated Waters Discharge (33 CFR 330). In addition, individual permit applications under Section 404 of the CWA may be required for the TOSS construction activities.

The construction activity at the selected NTC would require an individual action Section 404 permit. Portions (up to 46,000 linear feet) of the intermittent streams on the proposed NTCs were preliminarily identified as Waters of the U.S. by the Corps of Engineers Waterways Experiment Station (U.S. Army, 1996a). These streambeds have definable channels, intermittent water flow after rains, and are or may be used by visitors and residences for recreation and other activities. Therefore, the Corps of Engineers district engineer has preliminarily concluded that these stream segments are Waters of the U.S. unless additional information is provided indicating that the stream segments do not meet the definitions. Construction and use of either NTC would likely affect some or all of these potential Waters of the U.S. If either NTC training option is selected, final determination of these streambeds as Waters of the U.S. by the Corps of Engineers would be required. If these streambeds are determined to be Waters of the U.S., an individual Section 404 permit would be obtained from the Corps of Engineers district engineer for the NTC. The Section 404 process would be completed prior to construction.

Resource Conservation and Recovery Act (RCRA). A RCRA Part B permit is required to store hazardous wastes at a facility for periods longer than 90 days. The DRMO facility at Holloman AFB has an existing Part B permit. No change in this

permit would be required to support implementation of any of the proposed training options.

Air Quality Permit. A permit under the Clean Air Act (CAA) would be required for the construction and operation of the proposed paint booth, and potentially for other construction related to the proposed action, including installation of two 25,000-gallon fuel tanks, metal surface preparation operation, and backup generators. This proposed new equipment may also require a new source review under the regulations of the New Mexico Air Quality Review Board. It is expected that best available control technology to reduce emissions would be required. No other air quality-related permitting action would be required for the implementation of any of the proposed training options.

National Historic Preservation Act (NHPA) Section 106 Process. In preparing this EIS, the U.S. Air Force is complying with the NHPA and associated regulations that require that effects to cultural resources from federal undertakings be taken into consideration as part of the decisionmaking process. To comply with the NHPA, federal undertakings go through the Section 106 review process. This process consists of inventory (site identification), evaluation of each cultural resources eligibility for listing in the National Register, determination of effect, and avoidance or mitigation of impacts. As part of the environmental impact analysis process, the U.S. Air Force has completed cultural resources survey of the two NTC areas and made determinations of National Register eligibility for each archaeological resource identified in those areas. These are presented in a confidential cultural resources technical report (U.S. Air Force, 1998) prepared in support of the EIS. This report will be submitted to the New Mexico SHPO for concurrence on the determinations of eligibility. Determinations of effect and specific plans for avoiding or mitigating adverse effects to National Register-eligible archaeological sites will be made after issuance of the Record of Decision (ROD) and development of a Memorandum of Agreement between the Advisory Council on Historic Preservation (ACHP), the New Mexico SHPO, Holloman AFB, and Fort Bliss. Mitigation measures, including data recovery, for the sites adversely affected by the selected training option will be implemented prior to construction.

CHAPTER 3.0

EXISTING ENVIRONMENT

3.0 EXISTING ENVIRONMENT

This section presents information on environmental conditions for resources potentially affected by the proposed action training options, and serves as a basis for impact analysis in Chapter 4.0. The data presented here are drawn from the most recent sources; nonetheless, in some cases the best available data are several years old. Air monitoring data, for example, are typically several years old before they become available. Some baseline data, such as population data, can be projected forward through time based on regional growth patterns. Other data, such as archaeological resource information, would not be expected to materially change over the course of a few years. Where appropriate, baseline data used for this analysis have been projected forward to the time when the action would be implemented. For example, for purposes of providing a suitable baseline for analysis of socioeconomic impacts, recent population data have been projected forward through the year 2000. In a similar manner, airspace operations data used in the analysis are from FY95[1], and represent the most current data available at the time analysis for this action was begun. Where possible, environmental data have been projected to describe baseline conditions that would prevail at the time the proposed action would be implemented. With regard to airspace operations, FY95 operations data have been projected to FY00 when aircraft operations under the proposed action would be implemented.

3.1 AIRSPACE USE AND MANAGEMENT

Airspace use is managed by rules and regulations that govern how and where aircraft may fly, much like the highway system and traffic laws regulate vehicle travel. The FAA has the overall responsibility for managing airspace and works closely with airport planners, military airspace managers, and other interests to determine how airspace can best be used to serve both civil and military aviation needs. The FAA manages airspace use by (1) establishing rules that specify how aircraft must be operated, (2) depicting routes and other areas on maps that identify where aircraft may or may not fly, and (3) providing ATC services that help aircraft operate in a safe and orderly manner. Collectively, these means are intended to make airspace use as effective and compatible as possible for all types of aircraft, from private propeller-driven aircraft to large, high-speed commercial and military jet aircraft.

A brief explanation of the two types of flight rules (visual and instrument) is needed to better understand how they relate to the general means of managing airspace use. This will help explain how civil aviation is affected by airspace normally used for military flight training.

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[1] The Air Force collects data on aircraft operations by fiscal year. The fiscal year extends from October 1 of one year to September 30 of the following year. Impact analysis for this project was initiated in March of 1996, and the available data were for the period between October 1, 1994 and September 30, 1995 (i.e., FY95 data).

Private pilots flying between small airports and airfields within a familiar territory normally operate under visual flight rules (VFR). VFR allows them to fly visually along their desired route of flight within most airspace below 18,000 MSL without any ATC direction. VFR and, to the maximum extent possible, IFR pilots operate under the "see and avoid" concept, which means they look where they are flying and alter their course as necessary to remain clear of terrain, populated areas, and other air traffic. However, the majority of air traffic, including military aircraft, normally operate under IFR. IFR requires that pilots be assigned specific routes and altitudes for their entire flight by ATC. Elaborate radar and navigational systems help both pilots and ATC ensure IFR aircraft remain within these route and altitude assignments.

The affected test and training airspace has been previously reviewed and assessed by the FAA and DOD for any potential impacts on other airspace uses. DOD has played an integral part in the airspace management process by planning its training areas and implementing procedures to minimize the effects of military activities on other airspace uses. This section describes the current airspace and procedures that have been established in the local area to support DOD test and training activities and make them most compatible with civil aviation operations.

Section 2.1.4.3 identifies the MOAs, Restricted Areas/ranges, and MTRs associated with the proposed action, and the baseline use of each area. Conditions describing the current use and management of these areas are discussed below. Using FY95 baseline sortie information, the number of average daily sorties (based on 250 flying days per year) is indicated for each area, as appropriate, to give a more representative idea as to how this airspace is used on a day-to-day basis. This average is based on scheduled weekday flying approximately 52 weeks of the year.

3.1.1 FY95 Conditions

3.1.1.1 Holloman Aerodrome

The FAA has given the Holloman ATC radar and tower facilities responsibility for controlling all IFR air traffic within the general area of the base and has delegated, by Letter of Agreement, associated airspace for this responsibility. Holloman ATC has, in turn, established arrival and departure routes, traffic patterns, and special flight operating procedures within this airspace to ensure compatibility of their operations with other aircraft operations in the area. Civil aircraft operations occur near Holloman AFB at Alamogordo-White Sands Regional Airport, and three small private airports (Otero Mill, Gorby Ranch, and Beckett Farm) located north-northeast of the base.

Holloman ATC can provide radar traffic advisory services to VFR aircraft operating within their airspace and the parameters of their radar coverage. No significant changes are currently planned or anticipated for the existing airspace structure or instrument/operating procedures at Holloman AFB.

During FY95, 17,104 sorties (average 68 per normal flying day) were conducted out of Holloman AFB by the different types of aircraft identified in Table 2.1-1. These sorties generated approximately 33,217 operations (133 average daily operations) at Holloman for practice TGOs and low approaches, which are normally conducted at the conclusion of a sortie mission to meet pilot proficiency training requirements.

3.1.1.2 Military Training Routes

MTRs are essentially aerial "highways" of varying lengths, widths, and altitudes that are used for low-altitude flight tactics and navigation; MTRs may be charted down to the surface. Those MTRs included in the proposed action, and the baseline use of each, are identified in Table 2.1-5 and shown in Figure 2.1-15. A detailed description of each current route is published in the DOD Flight Information Publication (FLIP) AP/1B, *Military Training Routes, North and South America* (DOD, 1997). Table 3.1-1 summarizes the altitude, route width, and avoidance area information published for each route in the AP/1B. Avoidance areas are established to reduce direct overflight of airfields, cities and communities, and other sensitive land use areas. Local avoidance areas may be established that require lateral and vertical distances greater than the minimums specified in Federal Aviation Regulation Part 91. Section 3.3.1.3 provides further detail on the land uses and avoidance areas beneath these MTRs. These MTRs are normally flown during daylight hours with relatively few nighttime sorties, particularly after 10:00 pm.

A review of the FLIP, *IFR Enroute Low Altitude* (DOD, 1996), indicates that at least 17 different Federal Airways cross various MTR segments within the ROI. Airways are normally used by IFR aircraft below 18,000 feet MSL while flying between airports. Airway traffic is rarely a factor for MTR operations since these aircraft are operating at altitudes well above MTR ceilings and the lower altitudes normally flown by military aircraft. Airways can exist as low as 1,200 feet AGL; however, the lowest altitude that could be assigned by ATC to IFR aircraft on these airways generally ranges between 8,000 and 10,000 feet MSL. However, higher altitudes are normally flown for both fuel efficiency and flight safety in the event of an engine failure or other emergency. For the same reasons, any VFR aircraft transiting through the region and following these airways, or using highways or powerlines as flight references would also normally choose higher altitudes. Ranchers and other local VFR pilots may operate at lower altitudes when making shorter flights to various airstrips in the area.

MTRs also have little effect on airports since they are either designed to avoid busier airports entirely, or specific avoidance procedures are established around smaller private airfields. ATC ensures separation between IFR MTR flights where necessary to protect airport traffic. For instance, military aircraft entering IR-133 southeast of the Sierra Blanca Regional Airport are directed by the FAA Albuquerque Center to enter an alternate entry point further north of the airport when aircraft are on instrument approaches to this airport.

Table 3.1-1. Military Training Route Summary* (FY95)

MTR	Charted Altitude Range	Charted Corridor Width	Avoidance Summary
VR-100/125**	Surface-12,500' MSL	28 NM either side of initial/final segments, narrowing to 3-10 NM over remainder of route	Ft. Sumner Airport, Gran Quivira National Monument, 20 ranches, towns, and settlements
VR-176 Short/Long	100-5000' AGL	20-58 NM	Truth or Consequences and Socorro Airports, Gran Quivira National Monument, Acoma Pueblo Mission, and 11 towns and settlements
IR-102/IR-141**/***	500'AGL-10,000' MSL	7-20 NM	8 airstrips and town of Valentine
IR-113	100' AGL -11,500' MSL	8-10 NM	Ft. Sumner Airport, Gran Quivira National Monument, and 14 airstrips, ranches, towns, and settlements
IR-133	100' AGL-14,000' MSL	Varied as defined by geographical coordinates	Gran Quivira, Quarai, and Abo National Monuments and 14 airstrips, ranches, towns, and settlements
IR-134/IR-195**	100' AGL-12,500' MSL	Varied as defined by geographical coordinates	2 ranches
IR-192/IR-194**	100' AGL-12,500' MSL	10-20 NM	2 ranches

* Information as currently published in the DOD Flight Information Publication (FLIP) Area Planning AP/1B, *Military Training Routes*. (Note: Avoidance locations are constantly updated through aerial surveys and are subject to change. These updates are locally provided to pilots until they are incorporated in the FLIP.)

** MTRs are reverse courses of each other.

*** An independent proposal which has been submitted to FAA for approval would change the operating altitudes of these routes to a minimum of 100 feet AGL on some segments and to a maximum of 12,000 feet MSL. Corridor width would range from four to 20 NM.

ATC procedural controls, charting of MTRs for pilot awareness, pilot compliance with flight procedure, and "see and avoid" techniques have collectively made MTR use compatible with civil aviation activities.

3.1.1.3 Military Operations Areas

MOAs are established to separate nonhazardous military flight training from other IFR traffic and to identify for VFR pilots where these operations are being conducted. VFR aircraft are not restricted from flying through a MOA; however, all VFR and military pilots have to be attentive to one another's position and take action, as needed, to remain clear of each other.

By design and definition, MOAs can only be established up to, but not including, 18,000 feet MSL, an altitude above which all aircraft must be IFR. Because military pilots need higher altitudes to conduct air combat maneuvers and intercepts, Air Traffic Control Assigned Airspace (ATCAA) is established above most MOAs to extend working altitudes for this training. ATC ensures separation between military aircraft and any nonparticipating IFR air traffic being routed through the MOAs and ATCAA.

Beak, Talon, and Pecos MOAs are shown in Figure 2.1-14 and their use by aircraft types is shown in Table 2.1-5. These MOAs are used Monday through Friday and as needed on weekends to reschedule missions that could not be accomplished during weekdays. The Pecos Low MOAs are used intermittently and their times of use are publicized by the U.S. Air Force in a Notice to Airmen, a common means of issuing aviation information to all civil and military pilots.

The following is a summary of current MOA use and the relationship of these training areas to other airfields and airspace uses in their vicinity.

Beak A, B, and C MOAs. The Beak MOAs extend from 12,500 feet MSL up to, but not including, 18,000 feet MSL. Beak ATCAAs extend this training airspace up to Flight Level (FL) 290 over the MOAs and the Cowboy ATCAA further extends this airspace from FL290 up to FL490. The higher MOA floor provides a substantial buffer for VFR general aviation aircraft to operate below the MOA operations, if desired. Six private airstrips (Block, G Bar F, Diamond A, Skeen, Flying H, Transwestern) and two public airports (Sierra Blanca Regional and Carrizozo) either underlie or are adjacent to these MOAs. Historically, the use of the Beak MOAs has not conflicted with aircraft operations at any of these airfields. There are no Federal Airways within these MOAs; however, any IFR air traffic transiting this airspace is separated from military aircraft by ATC. The daily average use of the Beak MOAs by military aircraft is about three sorties.

Talon MOA. The existing Talon MOA extends from 12,500 feet MSL up to, but not including, 18,000 feet MSL. An ATCAA overlies the MOA up to FL290. Two private airstrips (2x4 and Seven Rivers) and two public airfields (Artesia and Cavern City) underlie or are adjacent to this MOA. One Federal Airway (V-83) transits the eastern portion of the MOA between Albuquerque and Cavern City. The average daily use

of this MOA is about seven sorties; these operations do not conflict with airport or airway traffic in this area.

Pecos High/Low MOAs. The Pecos High and Low MOAs extend from 500 AGL up to, but not including, 18,000 feet MSL, with the exception of an exclusion area around the Ft. Sumner Airport, where the MOA floor begins at 1,500 feet AGL. Three private airstrips (Double V, Bojax, and El Paso Natural Gas) also underlie these MOAs. No Federal Airways transit this MOA complex and general aviation traffic is low volume. The daily average number of sorties flown in the High and Low MOAs is about 12 and seven, respectively.

Additional Airspace Used for Air Combat Training Maneuvers. In addition to the MOAs described above, areas have been designated within WSMR and McGregor Range for air combat training maneuvers when additional airspace is needed for this type of training. WSMR encompasses Restricted Areas R-5107, R-5109, and R-5111, each of which is further subdivided (e.g., R-5111A, R-5111B, R-5111C) to support different test and training activities. Yonder, Lava East/West, and Mesa High/Low have been designated within subdivisions of R-5107 for air-to-air combat training, as shown in Figure 2.1-17. These areas extend from 500 feet AGL to FL500 (Mesa High and Low are divided at 9,000 feet MSL). Mesa High and Low are located in the northern portion of WSMR and the average daily use of each of these areas has been 26 and six sorties, respectively. Lava East and West are located just south of Mesa and daily average use of these areas is 26 sorties. The Red Rio and Oscura impact areas are located beneath Lava East. Yonder is located south of Lava West and this area only averages about two air combat training sorties daily.

McGregor High is within R-5103C and extends from 12,500 MSL to "unlimited" (upper altitudes needed and assigned by the FAA for specific missions). The average daily use of this airspace by Holloman aircraft is about two sorties per day. Since McGregor High, Lava East/West, Mesa High/Low, and Yonder are contained within restricted airspace comprising McGregor Range and WSMR, VFR or IFR aircraft cannot operate through these training areas when scheduled for use unless otherwise authorized by ATC. Therefore, air combat training in these areas does not affect civil air traffic in this region.

3.1.1.4 Restricted Areas

Restricted Areas are established around locations where hazardous activities such as bombing, gunnery, and artillery operations are conducted. Access to this airspace is limited to only those aircraft participating in these activities when the airspace is active and designated for joint use by the FAA. Restricted airspace surrounds the Oscura and Red Rio impact areas (portions of R-5107) and McGregor Range (R-5103) as shown in Figure 2.1-18. All of this restricted airspace extends from the surface to unlimited altitudes. One small private airfield (Timberon) lies within the northern boundary of the McGregor Range airspace; a 1,500-foot avoidance area is established around this airfield within R-5103. Therefore, there is no conflict between range activities and this airfield. The daily average number of sorties conducted on Oscura, Red Rio, and McGregor is six, 25, and five, respectively.

3.1.1.5 Aerial Refueling Anchors/Tracks

Aerial Refueling anchors (ARs) are used to refuel military aircraft, thus extending the mission capability of an aircraft sortie. ARs are established within specifically designated airspace that is normally above the altitudes where VFR aircraft are permitted to operate (above 18,000 feet MSL) or in areas not commonly used by these aircraft. ATC separates IFR air traffic from the refueling operations when the ARs are in use.

Two ARs in the local area are identified to support Tornado refueling missions. AR-602 lies east of Melrose Range and extends from 19,000 to 29,000 feet MSL; AR-644 overlies the Beak MOAs and extends from 20,000 to 26,000 feet MSL. These ARs support a variety of aircraft besides the Tornado and their overall use varies with the different types of test and training mission requirements they support.

3.1.2 Projected Baseline FY00 Conditions

As indicated in Section 2.1.4.3, airspace proposals are pending FAA approval which, if implemented, would modify existing ALCM routes, expand the Talon MOA, and establish a new AR. The number of sorties that would be conducted under FY00 conditions, with or without implementation of the proposed ALCM/Talon action, are shown in Tables 2.1-9 and 2.1-10. These proposed modifications and projected operations were previously evaluated and determined to have no adverse impacts on airspace use in the region (U.S. Air Force, 1997a).

3.1.2.1 Holloman Aerodrome

Average daily sorties conducted at Holloman AFB will decline from about 68 to 59 by FY00. The number of practice landings conducted upon completion of some sortie missions will also decline, from 133 to 112. These reductions will have no effect on airspace use in the aerodrome area.

3.1.2.2 Military Training Routes

Overall, MTR use by FY00 will increase about 39 percent above FY95 operational levels. However, distribution of these sorties over the MTRs now supporting Holloman AFB training will result in fewer sorties being flown on some individual routes. An average of one or less sortie per day will be flown on all MTRs except VR-100/125, VR-176 Short, IR-113, IR-133, and IR-141 Short. These routes will be used an average of about two to five sorties a day. These changes are not expected to interfere with any VFR aircraft that may operate in the vicinity of these MTRs.

An independent proposal, which has been submitted to the FAA for approval, would consolidate and modify existing ALCM routes for low-level training with manned aircraft. The consolidated route would be designated IR-102/141 (U.S. Air Force, 1997a).

3.1.2.3 Military Operations Areas

Daily average use of most MOAs and the range areas used for air combat maneuvers will decline by FY00. The only exception is that use of the Pecos Low MOAs will increase from about seven to 17 sorties a day. This increase is not expected to have any adverse effect on civil VFR or IFR air traffic operating in the vicinity of these MOAs.

An independent proposal currently pending FAA approval would modify and divide the Talon MOA into Talon High East, Talon High West, and Talon Low. Talon High East and West would extend from 12,500 feet MSL up to, but not including, 18,000 feet MSL. Talon Low would underlie a portion of High West and extend from 300 feet AGL up to 12,500 feet MSL.

3.1.2.4 Restricted Areas

Use of Restricted Area R-5107 will increase slightly (by about one sortie per day), while Melrose Range (R-5104/5) will increase by 10 daily average sorties above FY95 levels. McGregor Range (R-5103) use will decline to an average of about two sorties per day. Civil aircraft will be unaffected by these changes due to their restricted access to this airspace when scheduled for use.

3.1.2.5 Aerial Refueling Anchors

The two refueling anchors (AR-644 and AR-602) will continue to support mission activities in the region. AR-X652, a new anchor that has been submitted to the FAA for approval (U.S. Air Force, 1997a), would support Tornado mission activities in the region. Use of these anchors varies, depending on the aerial refueling requirements of each training mission or exercise. As discussed in Section 3.1.1.5, these anchors have little effect on other airspace uses due to their altitude and location.

If implemented, "buddy-buddy" refueling would be conducted randomly on various MTRs. This would involve one or two Tornadoes, flying along the route at low altitude, that would be joined by another Tornado at a random point along the route. This aircraft would refuel the aircraft flying the route and then exit to return to the base; the refueled aircraft would continue along the MTR. The refueling would require 10 to 20 minutes and occur at 1,000 feet AGL.

3.2 NOISE

Noise is perhaps the most identifiable concern associated with aircraft operations. Although many other sources of noise are present in today's communities, aircraft noise is often singled out for special attention and criticism. The description of the existing noise environment projected to occur from the proposed changes at Holloman AFB, and in the use of Restricted Areas, MOAs, and MTRs requires a general understanding of sound measurement and the effects of noise on humans,

animals, and structures. Appendix D provides a detailed description of the sound metrics, as well as a discussion of noise and its effects on the environment and land use compatibility. Following is a summary of the significant information needed to understand the information contained in this section.

In this EIS, sound levels are quantified by two basic noise-measuring techniques (metrics). Both metrics, unless otherwise noted, are based on A-weighted sound levels. A-weighting is a filter which approximates the way the human ear responds to sound. A-weighting levels represent how loud a sound is perceived by a person.

The first metric used is the Sound Exposure Level (SEL). This is a quantity that combines the sound level of an individual event with the duration of the event. During an individual aircraft event, the noise level is very low at the beginning and ending of the event. As an aircraft approaches, the sound level steadily increases to a maximum level, and then decreases until it fades into the background noise level. SEL represents the total acoustical energy during the event by combining the maximum level of the event and the duration of the event. SEL does not represent the sound level actually heard but provides a measure for comparing exposure of individual noise events. Typically, SEL is greater than the maximum level of an event when the aircraft is 500 feet AGL or higher.

The second noise metric is the Day-Night Average Sound Level (L_{dn}). The L_{dn} (alternatively denoted DNL) is a cumulative metric which accounts for the total sound energy over a 24-hour period, with sound levels of nighttime (10:00 pm to 7:00 am) noise events emphasized by adding a 10 dB weighting. The 10 dB weighting accounts for the lower sound levels and greater community sensitivity to noise during nighttime hours.

Studies on how people react to noise indicate that the important factors are: how loud the sounds are; how long each sound lasts; how many times a day they occur; and what hour of the day they occur. To provide a means to evaluate the relative impacts of the noise from a particular activity, the noise measurements approach (the metric) must be a tool that can account for all of these factors. To this end, this EIS uses L_{dn}, which allows noise from many different situations to be compared with each other.

Although L_{dn} is an "average", it represents the total sound occurring each day, and is often described as a "cumulative" measure of impact. It has been shown to properly account for individual loud events of the type that may occur with military aircraft operations. However, while L_{dn} measures the total effect of all the events, it does not describe the sound level for individual events. The EIS does contain tables (see Tables 4.2-1, 4.2-2, and 4.2-3) that show SEL and the maximum sound level that describe the noise from individual aircraft events.

L_{dn} still remains the primary noise metric for assessment. Studies on noise impacts to communities have shown that to properly assess the impacts from a particular activity, it is important and useful to separate the way individuals may react to noise from the way the community as a whole reacts to noise. Used in conjunction with

an extensive existing body of research (see Appendix D), the L_{dn} metric provides a means to accomplish this and to project a measure of the overall community reaction to aircraft noise levels associated with the proposed expansion of the GAF operations at Holloman AFB.

3.2.1 Holloman Air Force Base

Analysis of aircraft noise exposure and compatible land uses around Holloman AFB was accomplished using the NOISEMAP suite of computer programs. The NOISEMAP suite consists of NOISEFILE, BASEOPS, OMEGA10, OMEGA, NOISEMAP itself, and NMPLOT. NOISEFILE is a noise database for many models of aircraft. The BASEOPS program allows for entry of runway coordinates, airfield information, flight patterns, and flight profiles (power, altitude, and speeds) along each pattern by each aircraft, number of flight operations, run-up coordinates, run-up profiles, and run-up operations. The OMEGA10 program extrapolates/interpolates the SELs for each model of aircraft from the NOISEFILE database, taking into consideration the specified speeds, engine thrust settings, and environmental conditions appropriate to each type of flight operation. The OMEGA program calculates maximum A-weighted sound levels for each model of aircraft, taking into consideration the engine thrust settings and environmental conditions appropriate to run-up operations. The core NOISEMAP program incorporates the number of daytime (7:00 am to 10:00 pm) and nighttime (10:00 pm to 7:00 am) operations, flightpaths, and profiles of the aircraft to calculate Day-Night Average Sound Level (DNL [or L_{dn}]), at many points on the ground around the facility. The NMPLOT program draws contours of equal DNL for overlay onto land-use maps.

BASEOPS was used to establish baseline conditions for two cases of interest for the proposed action. In the first case, it was used to describe noise conditions that prevailed in FY95. Results from this run show noise conditions that prevailed prior to recent changes in force structure at Holloman AFB, such as the beddown of the 12 Tornado aircraft, and the withdrawal of the AT-38 aircraft. In the second case, BASEOPS was used to describe baseline conditions that would prevail immediately prior to implementation of the proposed action in FY00. This case takes into account the Tornado beddown in FY96, and the AT-38 withdrawal in FY97. Input data and results obtained for these two cases are presented in Appendix D. Results for both cases are summarized below.

Presented in Figures 3.2-1 and 3.2-2 are the Day-Night Average Noise Contours (L_{dn}) for Holloman AFB that prevailed for FY95 and that will prevail for FY00 baseline conditions. Table 3.2-1 shows the area circumscribed within various noise contour levels, and the change that will occur between FY95 and FY00 baseline conditions. Overall, the area within the 65 dB contour is projected to increase by about one square mile between FY95 and FY00.

This change would be distributed over the entire area and would amount to less than three percent of the total area within the 65 dB contour in FY95. Figure 3.2-3 highlights the locations where these changes will occur. Of interest is the

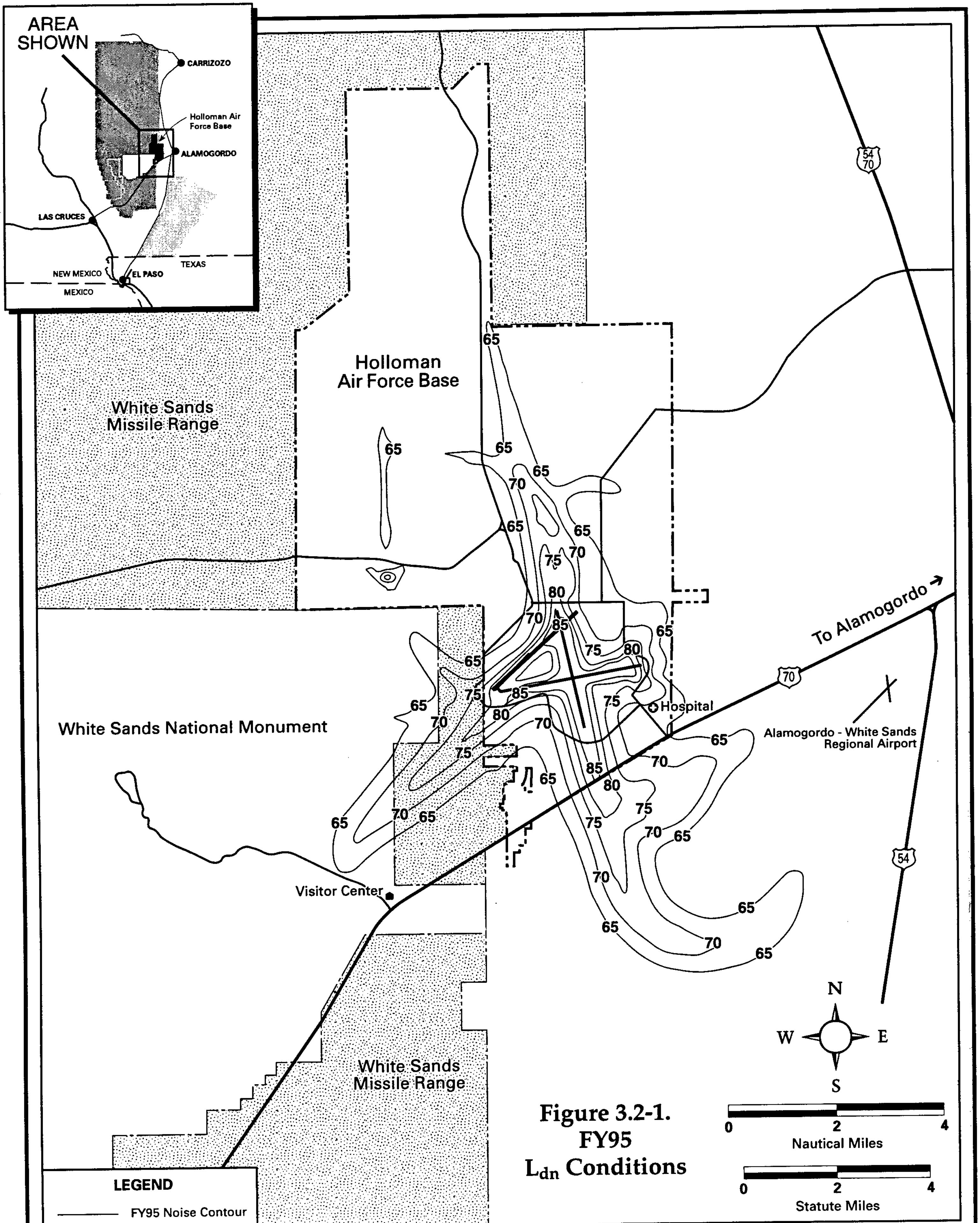

Figure 3.2-1. FY95 L_{dn} Conditions

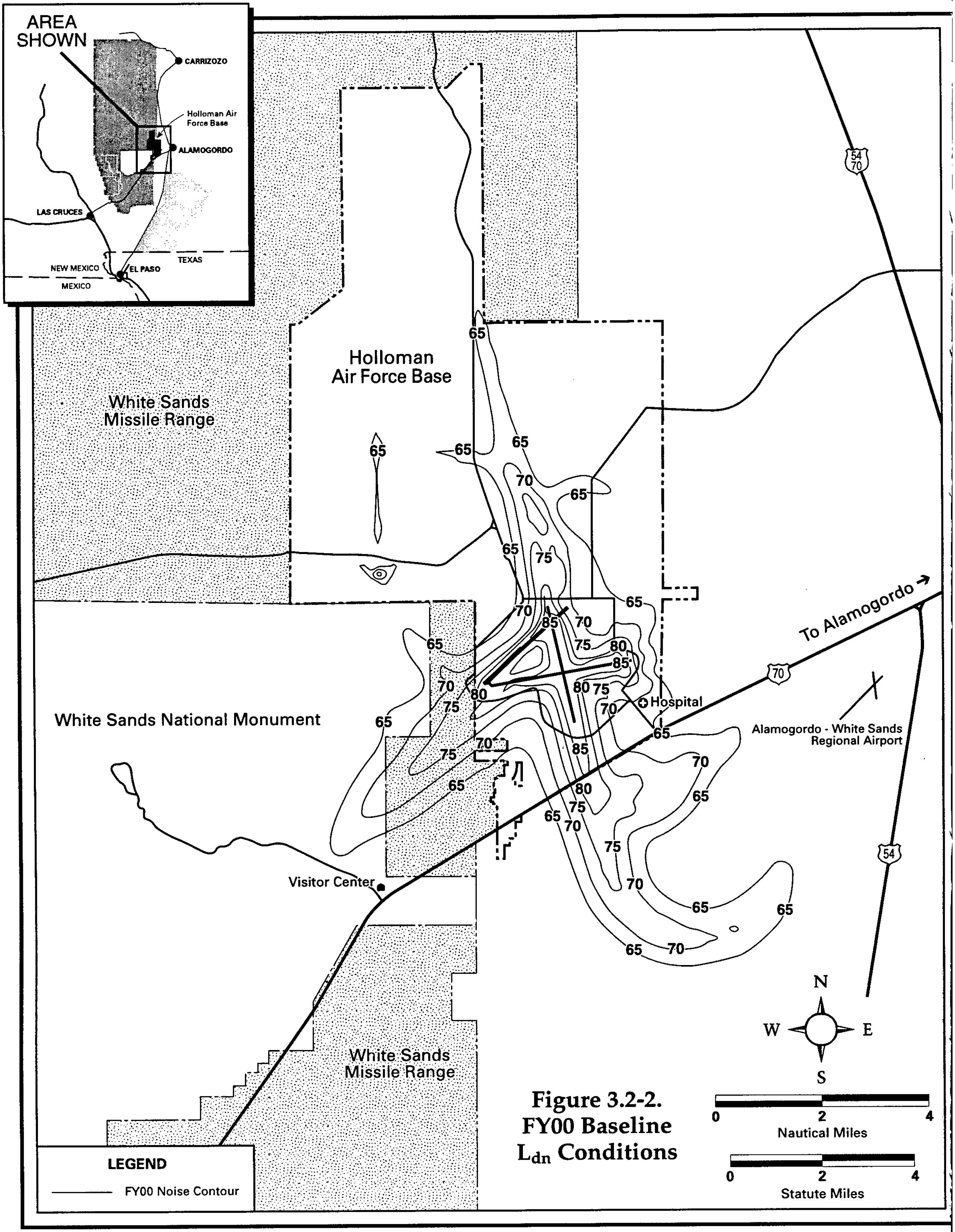

Figure 3.2-2. FY00 Baseline L_{dn} Conditions

Table 3.2-1. Area Enclosed by Various Noise Contours for Baseline Conditions

Contour Level (dB)	Area Contained within Various Contour Levels			
	Square Miles			Percent Change
	FY95 Conditions	FY00 Baseline	Change	
65	40.5	41.5	1.0	2.4%
70	21.2	21.8	0.6	2.7%
75	10.3	10.5	0.2	1.9%
80	4.7	4.7	0.0*	0.0*
85	2.1	2.1	0.0*	0.0*

* Change is less than 0.1 square mile.

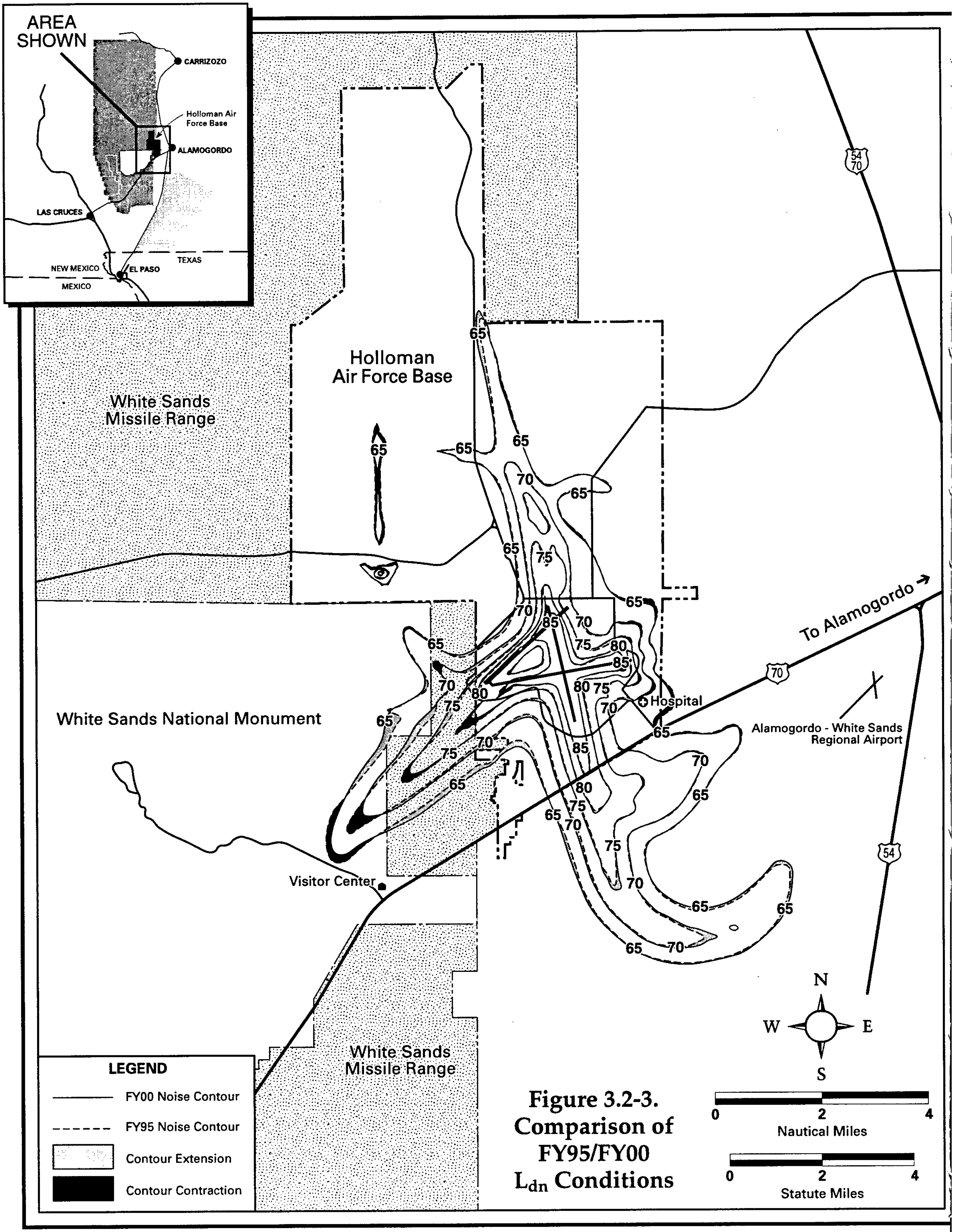

Figure 3.2-3. Comparison of FY95/FY00 L_{dn} Conditions

contraction of the noise contours in the area extending southwest toward White Sands National Monument. While overall noise levels increase slightly in the general area of the aerodrome, in this area changes in aircraft operations result in a slight reduction of noise levels in the underlying area.

3.2.2 Other Affected Airspace

Noise levels for the subsonic aircraft operations conducted in the affected Restricted Areas, MOAs, and MTRs were calculated using the U.S. Air Force's noise modeling computer program, MOA/Range NOISEMAP (MRNMAP) (Lucas and Calamia, 1996). These levels are presented in terms of the onset rate-adjusted monthly day-night average sound level (L_{dnmr}) in units of dB.

It is important to note that MRNMAP accounts for the "surprise" (startle) effect that results from a high-speed aircraft overflight by adding from 0 to 11 dB to the SEL for the event, depending on the rate at which noise from the approaching aircraft increases. An additional 10 dB is added to sound levels from nighttime aircraft operations (occurring between 10:00 pm to 7:00 am) to account for reduced background noise levels and increased sensitivity to noise at night.

Noise levels determined from historical records of aircraft operations in the existing airspace are presented in the following subsections. For the affected Restricted Areas, MOAs, and MTRs, the ROI includes current aircraft activity within existing airspace boundaries (FY95). Where airspace is proposed to be modified under independent actions by the year 2000, the ROI includes current aircraft activity within existing airspace boundaries where the modification would occur. It is important to note that noise levels are calculated on a cumulative basis. That is, any other coincidental, intersecting, and overlapping airspace that occurs within the ROI for a given airspace component being assessed is included in, or added to, the noise analysis.

Restricted Areas and Military Operating Areas. Flight operations within Restricted Areas and MOAs occur over a range of altitudes, depending on the type of aircraft, training missions, and airspace dimensions. For noise modeling purposes, typical flight altitude profiles, engine thrust settings, and airspeeds for each aircraft type were used to calculate the L_{dnmr} for each airspace component. The MRNMAP program, which is adapted to simulate a uniform horizontal distribution weighted by the percent of time that sorties are within a Restricted Area or MOA, was used to calculate the baseline sound level within the Restricted Areas and MOAs for comparison with similar levels calculated for the proposed action addressed in Chapter 4.0.

Military Training Routes. Flight operations within MTRs occur over a range of altitudes, depending on the type of aircraft, training mission, and airspace dimensions. For noise modeling purposes, typical flight altitude profiles, engine thrust settings, and airspeeds for each aircraft type were used to calculate the L_{dnmr} for each airspace component. The MRNMAP program was used to calculate noise levels for each segment of each MTR. This section presents the resulting cumulative

noise levels with the highest L_{dnmr} values calculated for conditions directly under the centerline. This provides baseline sound levels for comparison with similar levels calculated for the proposed action.

3.2.3 General Findings

The representative noise levels for the FY95 conditions and projected baseline FY00 conditions within the ROI are summarized in Table 3.2-2. Representative noise locations (reference points 1 through 91) were selected for analysis and comparison with similar levels calculated for the proposed action. The 91 reference points are presented graphically in Figure 3.2-4 and the description and location of the reference points are summarized in Table 3.2-3. Under FY95 conditions, the L_{dnmr} can range from a low of 35 dB to a high of 62 dB. In FY00, the noise levels are projected to range from a low of 35 dB to a high of 63 dB.

3.3 LAND USE

The area potentially affected by the proposed action includes portions of west-central, south-central, east-central, and southeast New Mexico, a portion of east-central Arizona, and west Texas. The area is characterized by large, sparsely inhabited areas, with scattered, isolated towns, small communities, and homesteads. Land in the area is owned and managed by a variety of entities, including private owners, DOD, BLM, National Park Service (NPS), USFS, and the states of New Mexico, Texas, and Arizona.

In New Mexico, much of the BLM, USFS, and state-owned land is leased, primarily for livestock grazing. Similarly, much of the state-owned land in west Texas is leased to ranchers. South-central New Mexico has extensive military reservations, including Doña Ana and McGregor Ranges, of Fort Bliss Military Reservation, and WSMR. The region also includes sovereign lands of several Native American groups. The primary land use outside the population centers is livestock grazing, with some forestry, agriculture, oil and gas exploration and extraction, tourism, and recreational uses.

3.3.1 FY95 Conditions

3.3.1.1 Holloman Air Force Base

Holloman AFB is located in south-central New Mexico, approximately 85 miles northeast of El Paso, Texas, and seven miles west of Alamogordo, which is the seat of Otero County. U.S. 54 links El Paso and Alamogordo. Primary access to the base is provided by U.S. 70. Holloman AFB adjoins WSMR, a U.S. Army Test and Evaluation Command Installation that supports a variety of research programs for the Army and other DOD agencies, foreign governments, and private industry.

Table 3.2-2. Onset Rate Adjusted Day-Night Average Sound Level for FY95 and FY00

Reference Points	Sound Levels FY95 Conditions (dB)	Sound Levels FY00 Baseline (dB)	Change (dB)
1	56	55	-1
2	60	62	2
3	50	50	0
4	58	61	3
5	42	42	0
6	43	42	-1
7	52	50	-2
8	53	57	4
9	39	39	0
10	53	59	6
11	39	39	0
12	43	48	5
13	49	48	-1
14	51	47	-4
15	42	47	5
16	42	46	4
17	50	47	-3
18	48	49	1
19	62	63	1
20	53	54	1
21	53	57	4
22	38	47	9
23	38	37	-1
24	38	49	11
25	37	49	12
26	41	53	12
27	46	47	1
28	52	55	3
29	55	57	2
30	50	51	1
31	53	56	3
32	49	54	5
33	47	53	6
34	50	51	1
35	50	51	1
36	42	49	7
37	40	49	9
38	42	51	9
39	53	56	3
40	41	56	15
41	35*	53	18*
42	35	47	12
43	55	56	1
44	54	56	2
45	36	36	0
46	39	39	0
47	39	39	0
48	39	39	0
49	38	38	0
50	48	46	-2
51	35*	35*	0*
52	35*	35*	0*
53	35*	35*	0*
54	46	47	1
55	35*	35*	0*
56	49	50	1
57	35*	47	12*
58	35*	49	14*
59	35*	35*	0*
60	48	54	6
61	36	42	6
62	45	45	0
63	48	52	4
64	51	50	-1
65	49	53	4
66	44	45	1
67	38	38	0
68	48	45	-3
69	45	46	1
70	35*	35*	0*
71	48	54	6
72	37	41	4
73	43	47	4
74	40	48	8
75	37	51	14
76	38	37	-1
77	38	49	11
78	46	56	10
79	35*	44	9
80	35*	35*	0*
81	35*	54	19
82	35*	39	4
83	46	48	2
84	54	55	1
85	35	35	0
86	50	52	2
87	40	40	0
88	35*	35*	0*
89	35*	35*	0*
90	35*	35*	0*
91	39	39	0

* Reference point located outside region of aircraft noise. Assume a background noise level of 35 dB.

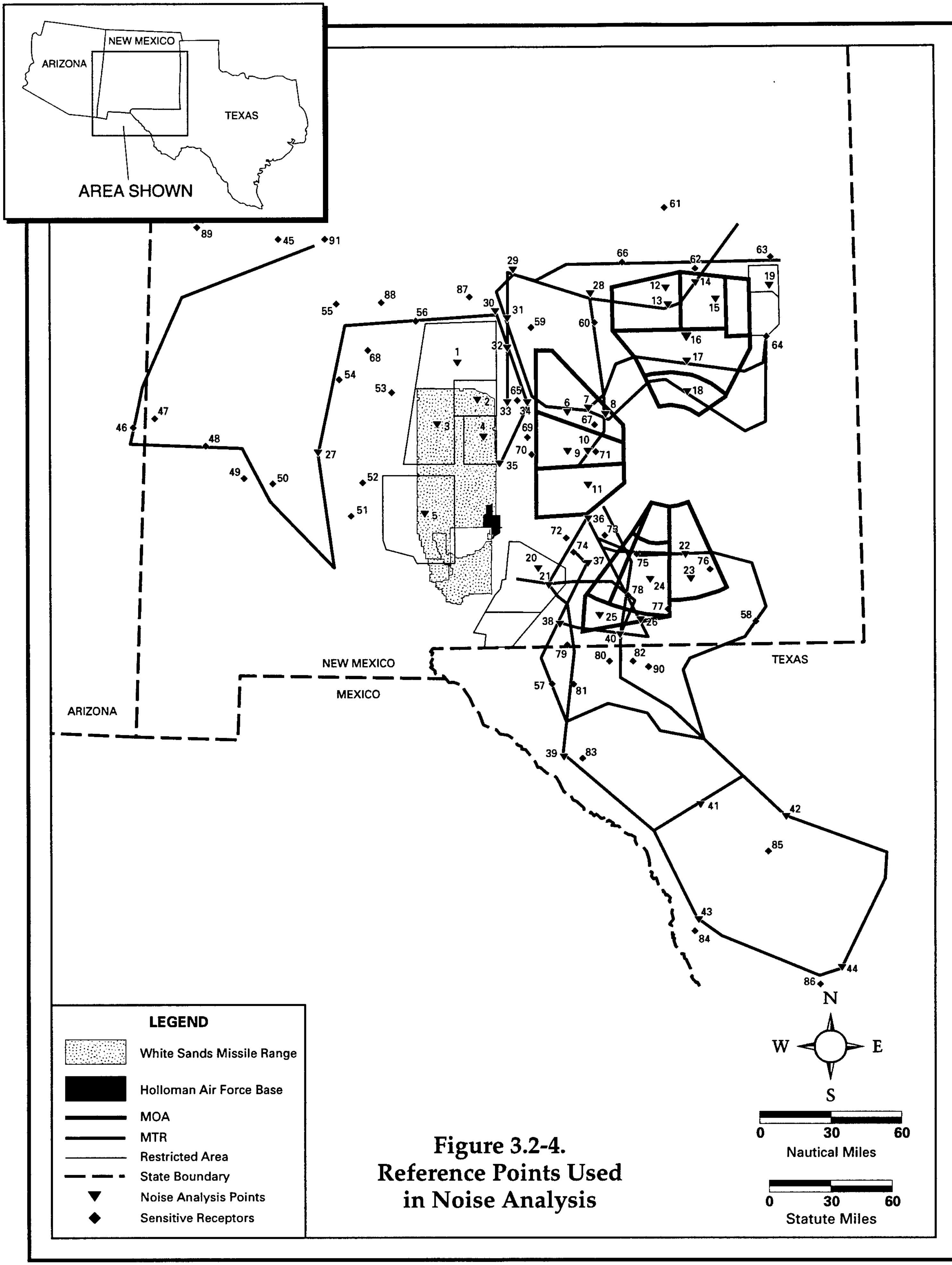

Figure 3.2-4.
Reference Points Used in Noise Analysis

Table 3.2-3. Description of Reference Points Used in Noise Analysis

Point*	Latitude	Longitude	Description
1	34°00'00"	106°25'00"	Mesa
2	33°45'00"	106°15'00"	Red Rio
3	33°35'00"	106°35'00"	Lava
4	33°30'00"	106°12'00"	Oscura
5	32°58'00"	106°41'00"	Yonder
6	33°40'00"	105°30'00"	Beak A
7	33°41'30"	105°19'30"	Beak A, IR-113, VR-100, VR-125
8	33°39'00"	105°11'00"	Beak A, IR-133, VR-100, VR-125
9	33°24'00"	105°30'00"	Beak B
10	33°24'00"	105°20'00"	Beak B, IR-133
11	33°10'00"	105°20'00"	Beak C
12	34°30'00"	104°40'00"	Pecos West
13	34°23'00"	104°39'00"	Pecos West, IR-113, VR-1195, VR-1107
14	34°32'00"	104°25'00"	Pecos East, IR-113
15	34°25'00"	104°15'00"	Pecos East
16	34°10'00"	104°30'00"	Pecos South
17	34°00'00"	104°30'00"	Pecos South, IR-113
18	33°49'00"	104°30'00"	Pecos South High, VR-100, VR-125
19	34°30'00"	103°48'00"	Melrose
20	32°35'00"	105°45'00"	McGregor
21	32°27'54"	105°39'48"	IR-134/195, IR-192/194, McGregor
22	32°40'18"	104°32'24"	Talon, IR-192/194
23	32°30'00"	104°30'00"	Talon High East
24	32°30'00"	104°50'00"	Talon High West/Low
25	32°15'00"	105°15'00"	Talon Low
26	32°13'00"	104°55'00"	Talon Low, IR-134/195
27	33°23'00"	107°36'00"	VR-176
28	34°28'00"	105°18'00"	IR-113, IR-133, VR-1107, VR-1195
29	34°38'00"	105°57'00"	IR-113, IR-133, VR-100, VR-125
30	34°21'00"	106°06'00"	VR-176
31	34°18'00"	106°00'00"	IR-113, IR-133, VR-100, VR-125
32	34°06'00"	106°00'00"	IR-133, VR-176
33	33°44'00"	106°00'00"	IR-133
34	33°44'00"	105°50'00"	VR-176
35	33°19'00"	106°04'00"	VR-176
36	32°56'00"	105°20'06"	IR-192/194, IR-134/195
37	32°37'00"	105°20'30"	IR-134, IR-194
38	32°11'30"	105°34'30"	IR-192/194, IR-134/195
39	31°16'00"	105°33'00"	IR-102L, IR-102S, IR-141L, IR-141S
40	32°06'30"	105°04'00"	IR-102S, IR-102L, IR-141S, IR-141L, IR-134/195
41	30°54'00"	104°27'30"	IR-102S, IR-141S
42	30°48'18"	103°44'06"	IR-102L, IR-141L
43	30°05'05"	104°28'30"	IR-102L, IR-141L
44	29°42'30"	103°19'30"	IR-102L, IR-141L

Table 3.2-3. Description of Reference Points Used in Noise Analysis (continued)

Point*	Latitude	Longitude	Description
45	34°52'00"	107°56'00"	El Malpais National Monument
46	33°30'00"	109°10'00"	Blue Range Primitive Area, AZ
47	33°33'00"	108°58'00"	Blue Range Wilderness, NM
48	33°25'00"	108°30'00"	Gila Wilderness/VR-176 centerline
49	33°12'00"	108°13'00"	Gila Hot Springs
50	33°10'00"	107°56'30"	Aldo Leopold Wilderness
51	32°57'30"	107°17'30"	Caballo Reservoir
52	33°11'00"	107°12'00"	Elephant Butte Reservoir/State Park (south end)
53	33°48'00"	106°52'30"	Bosque del Apache NWR (central)
54	33°53'00"	107°26'00"	Withington Wilderness (central)
55	34°20'52"	107°28'25"	Alamo Navajo Reservation
56	34°17'00"	106°46'00"	Sevilleta NWR/VR-176 centerline
57	31°46'39"	105°39'02"	IR-192/194 (west)
58	32°11'37"	103°56'40"	IR-192/194 (east)
59	34°14'30"	105°48'00"	Cibola National Forest, Gallinas Peak unit
60	34°16'20"	105°16'00"	North Lincoln County (rural)
61	35°01'28"	104°41'25"	Santa Rosa Lake
62	34°38'00"	104°25'00"	Lake Sumner State Park
63	34°42'00"	103°47'00"	McAlister (north of R-5105)
64	34°09'00"	103°48'30"	Rural area south of R-5104 (VR-100/125, IR-113)
65	33°45'00"	105°44'00"	Little Black Peak WSA
66	34°41'04"	105°00'45"	VR-100/125
67	33°35'00"	105°16'30"	Capitan Mountains Wilderness/Capitan Peak
68	34°05'00"	107°10'00"	Magdalena Mountains, Water Canyon
69	33°30'00"	105°50'00"	White Mountains Wilderness Area (VR-176)
70	33°23'00"	105°48'00"	Mescalero Indian Reservation, Ruidoso Rec. Area
71	33°24'00"	105°16'00"	Hondo (Beak B, IR-133)
72	32°48'00"	105°31'00"	Weed
73	32°49'00"	105°12'00"	Dunken
74	32°42'00"	105°27'30"	Avis
75	32°41'00"	104°56'30"	Grazing (east Otero County) (IR-192/194, IR-102/141)
76	34°06'00"	106°00'00"	Brantley Lake State Park
77	32°17'30"	104°41'30"	Sitting Bull Falls Recreation Area, Lincoln NF
78	32°23'30"	104°41'30"	Guadalupe escarpment (Talon MOA, IR-134/195, IR-102/141)
79	32°01'30"	105°31'00"	Wind Mountain ACEC (IR-194/102/141)
80	31°56'00"	105°10'30"	Dell City (eastern outskirts)
81	31°46'30"	105°28'00"	Cornudas, TX
82	31°53'30"	104°59'00"	Guadalupe NP, west edge
83	31°15'30"	105°24'00"	Sierra Blanca (north subdivision)
84	30°00'30"	104°26'00"	Chinati Mountains (northeast corner)
85	30°35'30"	103°55'30"	Fort Davis
86	29°36'00"	103°30'00"	Terlingua Ranch subdivision (near Nine Point Mesa)
87	34°27'00"	106°19'00"	Salinas Pueblo Missions National Monument, Abo unit
88	34°24'30"	107°03'30"	Ladron Peak/Sevilleta NWR (edge)
89	34°50'00"	108°37'00"	Zuni Indian Reservation (southeast corner, VR-176)
90	31°53'30"	104°51'30"	Guadalupe Peak
91	34°54'00"	107°34'30"	Acoma Pueblo

*Points 1 to 44, referred to as "Noise Analysis Points", are unique noise analysis reference points that characterize noise levels at the MTR centerline or intersection of two or more MTRs and are thus indicative of areas of anticipated highest noise levels.

Points 45 to 91, referred to as "Sensitive Receptors", are noise analysis reference points that characterize locations representative or typical of communities or special protected areas (e.g., wilderness, wildlife, Native American lands, and state and national parks and monuments) in the vicinity of an MTR.

The base covers approximately 59,600 acres (93 square miles), including a noncontiguous well field east of U.S. 54. Land uses on the base include mission-related, airfield, industrial, administrative, community, residential, and open space areas. The cantonment area of Holloman AFB contains the urbanized area of the base, including administration, housing, community and medical facilities, and recreation. The generalized distribution of land uses within the cantonment area is shown in Figure 3.3-1. The airfield is located on the north side of the cantonment area. Family housing is located in the southeastern section of the cantonment area. Much of the base property is open space and includes conservation areas, wetlands, undeveloped land, and buffer space required for safety clearances, security areas, utility easements, and environmentally sensitive areas. Test operations are conducted at a large sled track facility in the northern portion of the base.

The base is in the process of revising its Base Comprehensive Plan, which sets goals and objectives for development and defines infrastructure and facility requirements to meet future needs. The Plan attempts to organize site development to accommodate future mission requirements and site constraints such as quantity-distance safety setbacks[1], airfield setbacks and Clear Zones, cultural resources and historic buildings, noise exposure levels, wetland and floodplain areas, hazardous waste remediation sites, potential threatened and endangered species habitat, location of utility lines, and extent of utility distribution.

The base uses the Air Installation Compatible Use Zone (AICUZ) program to provide land use compatibility guidelines for areas exposed to increased safety risks and noise in the vicinity of the airfield, and to maintain a safe environment for aviation. Uses of areas at the ends of the runway are restricted to prevent incompatible development where the potential for aircraft accidents is high. The most restrictive areas (Clear Zones) extend for 3,000 feet immediately off the ends of runway thresholds. At Holloman AFB, the Clear Zones are within the boundaries of the base (except for a portion of one that extends into WSMR), allowing the U.S. Air Force to control use and construction in these areas. Beyond the Clear Zones are two Accident Potential Zones (APZ I and APZ II), extending an additional 5,000 and 7,000 feet respectively, where hazards from aircraft accidents are still high but diminish at distances further from the runway. In these zones, low-density residential use is acceptable, and light commercial and industrial uses are compatible. Within the base, there are no incompatible uses within currently defined APZs.

Under the AICUZ program, recommendations of land use compatibility based on noise exposure have been developed based on the Federal Interagency Committee on Urban Noise (FICUN) report (1980). A summarized version of these guidelines has been adopted by several Federal agencies, including FAA and Departments of Defense, Housing, and Urban Development, and EPA, and are shown in Table D-1 in Appendix D. Noise levels from operations at Holloman AFB are shown in

[1] Quantity-distance setbacks are safety zones around facilities that store explosives in which uses and human activity are restricted. The size of the area is defined as a distance around the facility determined by the type and quantity of explosive material stored in the facility.

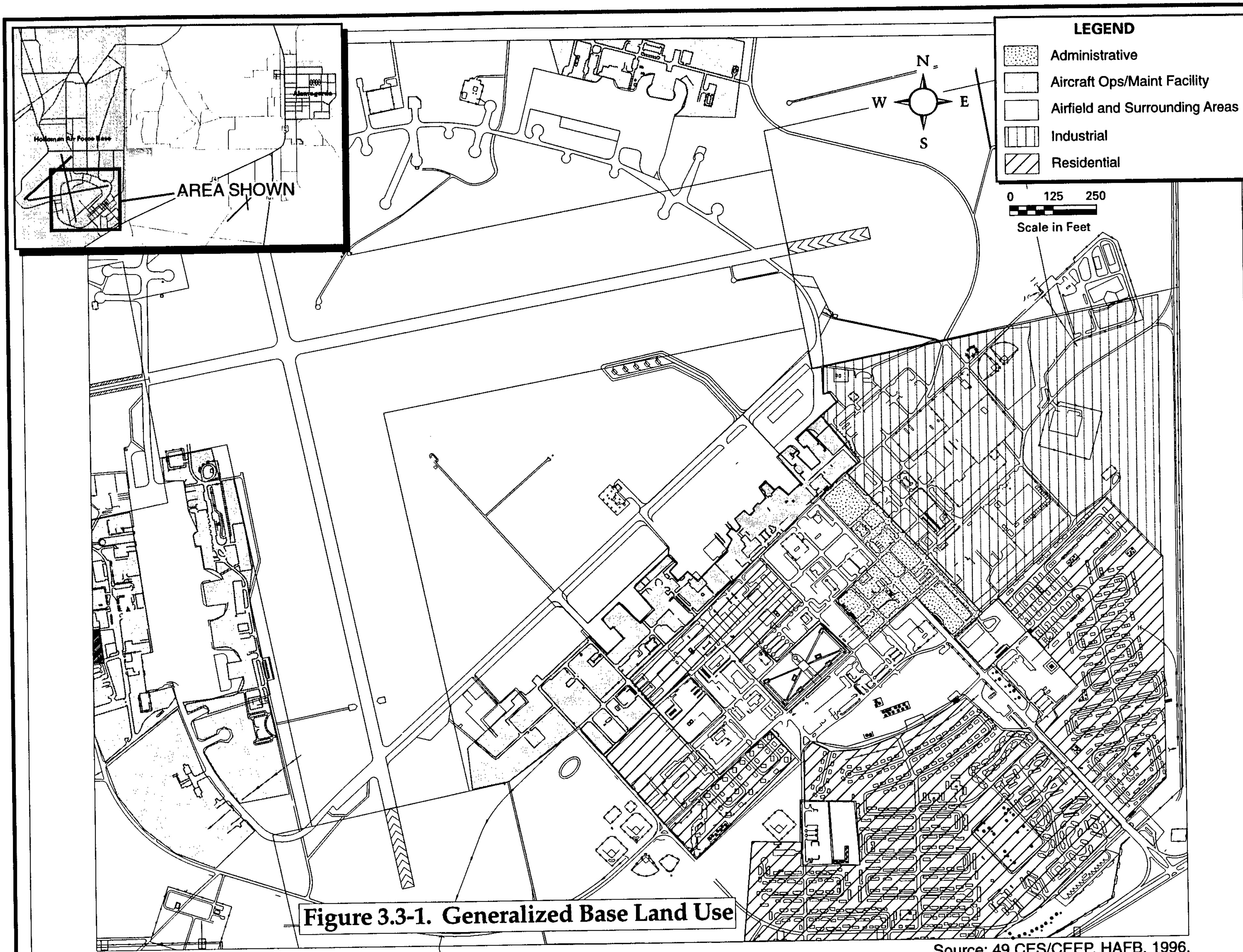

Figure 3.3-1. Generalized Base Land Use

Source: 49 CES/CEEP, HAFB, 1996.

Figure 3.2-1 for FY95 conditions. In FY95, about 19.7 square miles were exposed to L_{dn} 65 dB and greater on-base. Facilities along and close to the flightline experience high noise levels (above L_{dn} of 80 dB), particularly on the west side of the airfield. Current mission-related activities are acceptable in these areas provided that persons working outdoors wear hearing protection and requisite noise level reduction (NLR) construction is incorporated into facilities for persons working indoors. Housing areas on the southeast side of the cantonment area are exposed to incompatible noise levels up to L_{dn} 75 dB. AICUZ recommends NLR construction to attenuate indoor noise levels for residences in areas exposed to noise levels between L_{dn} 65 and 75 dB, and does not recommend residences in areas experiencing levels above 75 dB. Open space areas and sewage lagoons south of the airfield experience levels between L_{dn} 74 and 85 dB.

3.3.1.2 Areas in the Vicinity of Holloman AFB

Figure 3.3-2 shows the region around Holloman AFB. Public lands administered by BLM lie to the south and northeast. These areas are primarily leased for grazing. White Sands National Monument, comprised of about 145,000 acres, lies southwest of the base. A strip of land within WSMR separates the airfield and cantonment area on Holloman AFB from the monument. The monument is administered by the NPS and used for recreation and preservation. Activities in the monument include picnicking, driving through the dunes, hiking, seasonal interpretive programs, and camping. The majority of activity is concentrated at the visitor center and along the road leading into the monument, where there are interpretive exhibits, visitor parking, and a developed hiking trail. Eight buildings at the monument headquarters comprise a historic district and are listed on the National Register of Historic Places. The monument receives approximately 600,000 visitors each year, including an estimated 2,500 to 3,000 overnight campers at an undeveloped campsite close to the road, about four miles northwest of the visitor center. Administrative activities are conducted at the visitor center. Several park employees reside at the monument (Ditmanson, 1997).

Adjacent to the east, southeast, and southwest boundary of the base lie state and private lands, within the jurisdiction of Otero County. Land use in these areas is primarily undeveloped or open grazing. There is a privately owned gravel pit operation to the southwest of the base. Scattered commercial development has occurred to the east of the base along U.S. 70 between the corporate limits of Alamogordo and Holloman AFB. However, lack of available potable water supplies in this area has inhibited much commercial or industrial growth. Land use between U.S. 70 and U.S. 54 consists of grazing, residential, light industrial, commercial, and the Alamogordo/White Sands Regional Airport. Located further northeast of the base are the communities of Tularosa, La Luz, and High Rolls.

The City of Alamogordo has concurrent jurisdiction with Otero County for land use regulation of subdivisions within five miles of the city's limits. This includes lands currently exposed to noise from Holloman AFB. At this time, the county and the city do not have policies to consider AICUZ and FICUN (see Appendix D, Table D-1)

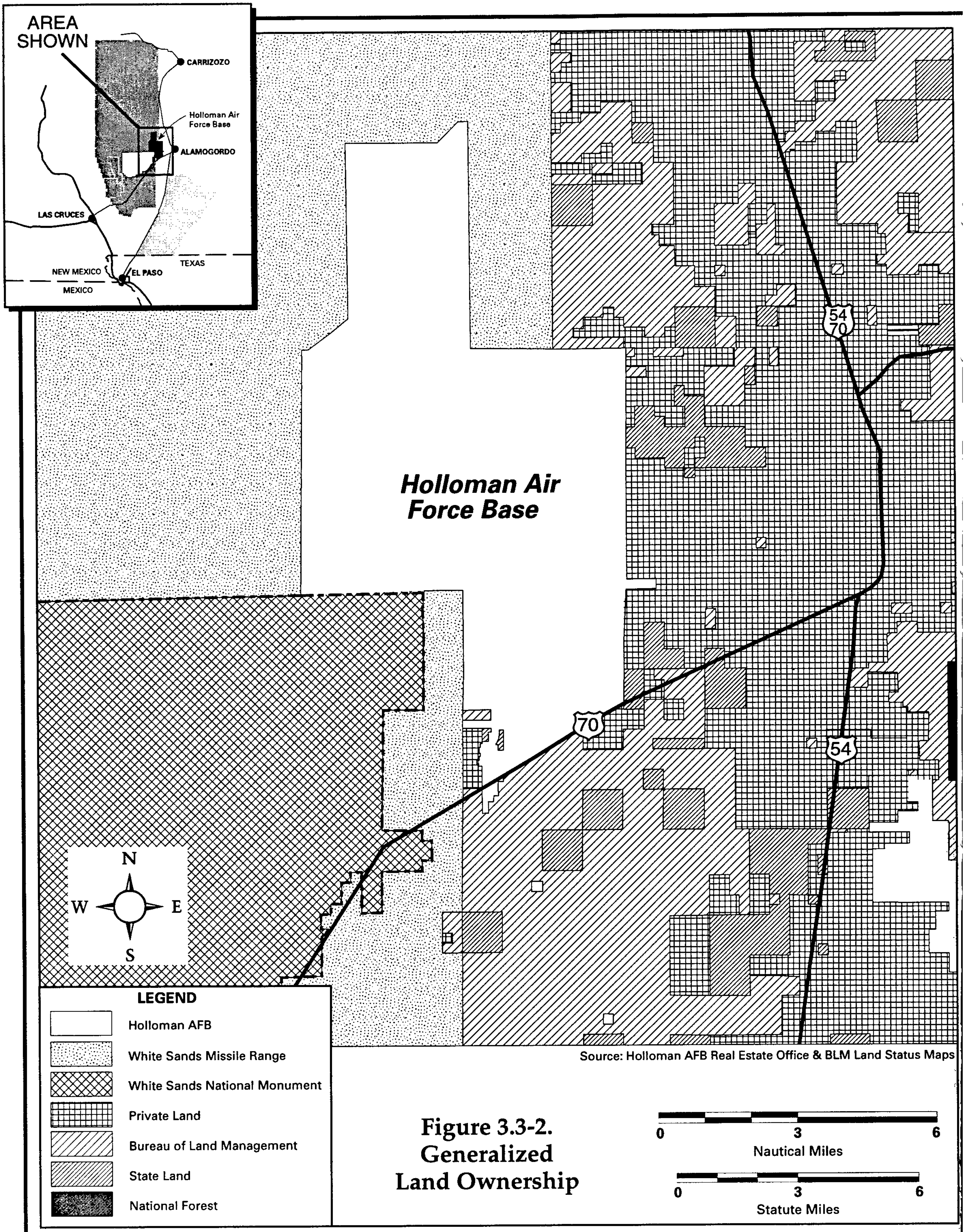

Figure 3.3-2.
Generalized
Land Ownership

recommendations when permitting subdivisions and other developments in areas exposed to noise from the base (Browning, 1996; Few, 1996 and 1997).

Areas within the APZ I and II extend beyond the base boundary to the east over undeveloped state and private lands and to the south over land administered by the BLM. Livestock grazing is the primary activity in these areas. To the west and southwest, the APZs extend over WSMR and White Sands National Monument. There are currently no facilities in these areas. Dispersed recreational use on the monument is compatible in these areas.

In FY95, about 20.8 square miles off-base, of which about 1.36 square miles were privately owned, experienced noise levels of L_{dn} 65 and greater. Livestock grazing areas south of the base that experience noise levels greater than L_{dn} 65 are compatible under AICUZ recommendations up to L_{dn} 80 dB, provided appropriate NLR is used in associated facilities. Livestock grazing is not recommended where noise levels exceed L_{dn} 80 dB and, therefore, a small area south of U.S. 70 is incompatible with current noise levels. However, there are no residential structures in this area (King, 1997). To the west and southwest, noise levels above L_{dn} 65 dB extend over WSMR and White Sands National Monument. These levels are compatible with activities supporting test and training on WSMR. About 2.9 square miles (1.3 percent) of the monument experience noise levels of L_{dn} 65 and greater. Noise levels up to L_{dn} 73 dB on the monument are generally compatible with outdoor recreational use under AICUZ guidelines, but may not meet goals set by the NPS to provide optimum conditions for public enjoyment. White Sands National Monument experiences noise at the visitor center and along the road leading to it from aircraft operating at Holloman AFB that is annoying to administrative personnel and park visitors on a daily basis, although they only communicate with Holloman AFB on occasion when overflights are particularly disturbing (Ditmanson, 1997). Standard flight patterns used by aircraft departing from Holloman AFB to the south are routed to avoid the monument headquarters and visitor center. However, due to close proximity and location of these facilities in relation to runways at Holloman AFB, they are occasionally overflown. Park administration has suggested that adjustments to flight patterns may help some of the current problems (Ditmanson, 1997). Holloman AFB procedures call for all pilots to avoid overflight of the monument headquarters by 2,000 feet AGL or by a lateral distance of one NM in accordance with AFI 11-206 (U.S. Air Force, 1994b).

3.3.1.3 Areas Underlying Affected Airspace

Figures 3.3-3 and 3.3-4 show the location of special use and noise-sensitive resources underlying existing MTRs and MOAs. Appendix E provides information on population densities and special land uses within the region. Average population densities for counties underlying MTRs and MOAs range from one to 30 persons per square mile. Average densities are based on total population divided by total area, using U.S. Census information. However, population in the region tends to be concentrated in towns and villages. Therefore, rural average density, which is more typical of densities underlying MTRs and MOAs, is also provided. This does not include population in towns and scattered communities. Average rural densities

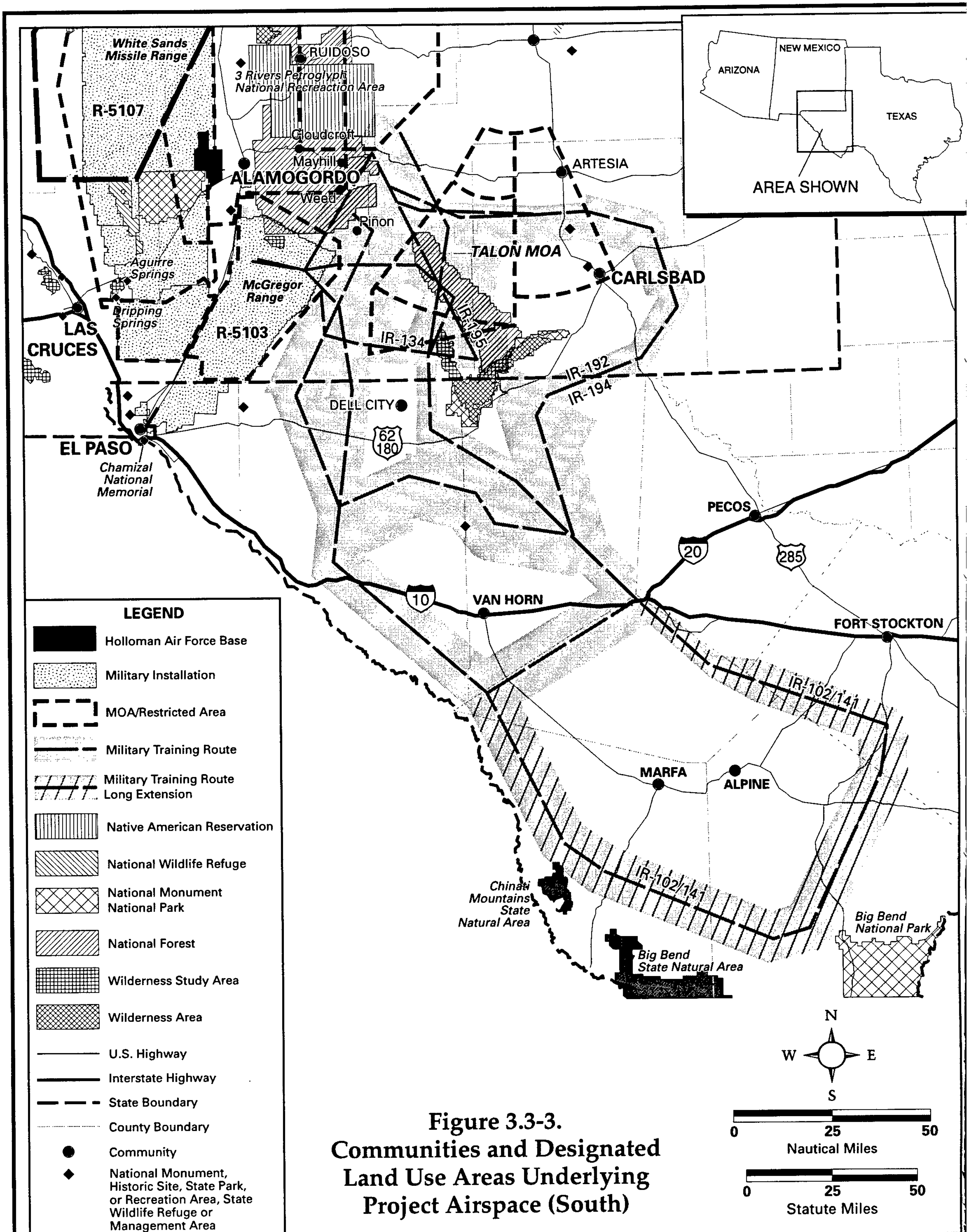

Figure 3.3-3. Communities and Designated Land Use Areas Underlying Project Airspace (South)

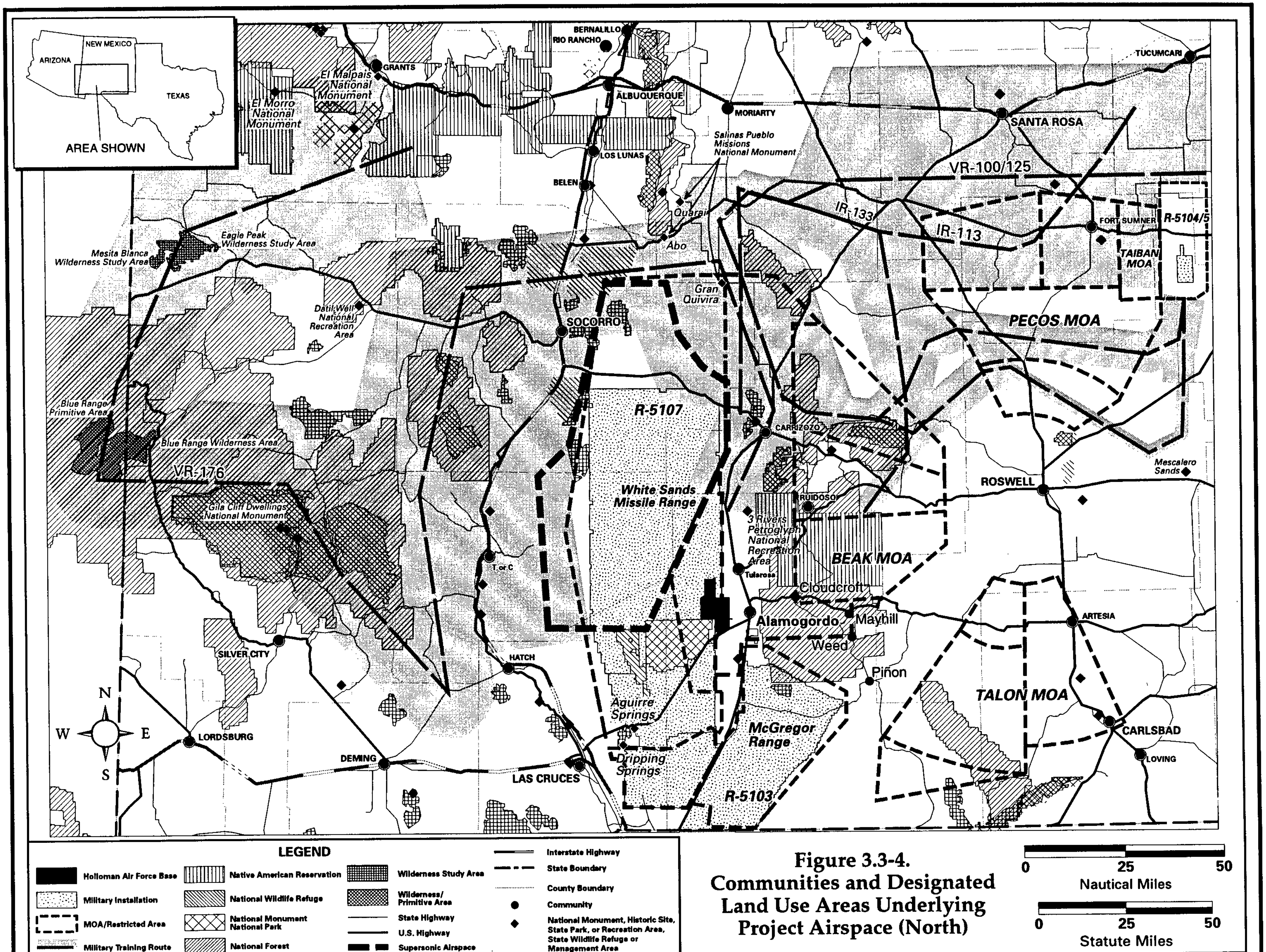

Figure 3.3-4.
Communities and Designated Land Use Areas Underlying Project Airspace (North)

underlying training airspace range from less than one to about four persons per square mile. Appendix E also provides information about counties, communities, and specially designated land use areas underlying MTRs and MOAs used for training by Holloman units.

Most of the area underlying the affected airspace in the region is open rangeland used for dispersed livestock grazing. Other uses include limited agriculture, mining, oil and gas exploration and extraction, forestry, tourism, and recreation. Small communities and isolated ranches and homesteads are scattered throughout the area. With the exception of eastern New Mexico and west Texas, most of the land is managed by Federal agencies.

The following paragraphs provide a summary of existing land uses and specially designated land use areas underlying airspace that would be used under the various training options.

United States Forest Service. Extensive areas of National Forest underlie the affected airspace, including portions of Lincoln, Cibola, Gila, and Apache-Sitgreaves National Forests. These areas are used for multiple purposes, but primarily for forestry, grazing, and recreation. Several Wilderness Areas within these areas, including Blue Range, Gila, Aldo Leopold, Apache Kid, Withington, Capitan Mountains, and White Mountains, are managed to protect natural qualities and quietude. Agencies and commenters have indicated that some of these Wilderness Areas, particularly in western New Mexico, offer opportunities for solitude due to their remote locations and low visitation.

National Park Service. NPS manages five parks and monuments, portions of which underlie the affected airspace. These include El Malpais National Monument, Gila Cliff Dwellings National Monument, Salinas Pueblo Missions National Monument sites at Abo, Gran Quivira, and Quarai, Guadalupe Mountains National Park (park access road only), and White Sands National Monument (see Section 3.3.1.2 for a description of White Sands National Monument). Carlsbad Caverns National Park, El Morro National Monument, and Big Bend National Park are also located in the region but do not underlie affected airspace and therefore do not warrant further consideration.

El Malpais National Monument and Conservation Area, underlying VR-176 Long, has extensive land in western New Mexico, with unique geologic conditions. The area is used for a variety of remote hiking and backcountry activities, as well as more centralized visitor activities. Visitation generally averages between 90,000 to 100,000 annually (Mabery, 1996 and 1997).

Gila Cliff Dwellings National Monument, in southwest New Mexico, also underlying VR-176 Long, has valuable cultural resources. The monument receives about 60,000 visitors annually. The monument is surrounded by the Gila Wilderness Area, which is used for hiking and backcountry camping (Shay, 1997).

Salinas Pueblo Missions National Monument consists of three sites: Gran Quivira (under VR-176 Short, VR-100/125, IR-113, and IR-133), Abo, and Quarai (under VR-176 Short). Remains of Spanish colonial missions from the 1600s as well as prehistoric pueblos at these sites contribute to their cultural resource value. Combined visitation to these sites in 1996 was about 80,000 (Boll, 1997). Existing avoidance procedures for these routes reduce noise and overflight of these sites.

Guadalupe Mountains National Park and Wilderness Area (Figure 3.3-5), located in west Texas, includes areas of outstanding geologic and scenic value. Nearly half of the park (46,850 acres) is designated as a Wilderness Area. The park received about 223,500 visitors in 1996, with hiking and backpacking being the primary attraction (McCamant, 1997). The park has been authorized by Congress to acquire additional land in low-lying salt flats and sand dunes along its western edge in order to extend protection over these natural resources. Part of this area has already been acquired. NPS is planning to develop visitor facilities in this portion of the park. An access road on the east side of the park partially underlies the edge of the IR-192/194 corridor.

Carlsbad Caverns National Park and Wilderness Area (Figure 3.3-5), immediately east of (but not underlying) the IR-134/195 corridor, is renowned for unique geologic cave formations. In 1996, the park received about 509,300 visitors (Childress, 1997). Most visitor activity is concentrated at the visitor center and caves at the eastern end of the park. Wilderness Areas within the park are used for backcountry hiking and camping.

El Morro National Monument is located in west-central New Mexico, bordering VR-176. This monument features a large cliff face known as Inscription Rock, that has been signed by travelers (most notably, Billy the Kid), who stopped at the watering hole at the base of the rockface. It also has Anasazi ruins on a mesa top surrounding a box canyon accessible from hiking trails. In 1996, the monument received 82,644 visitors (Rena, 1997). Visitor activity is concentrated within one mile of the headquarters building. Facilities include over two miles of hiking trails, a small museum, small campground, and employee housing.

Big Bend National Park is located in southwest Texas within a great bend of the Rio Grande along the U.S./Mexican border. The park includes 1,252 square miles, and 118 miles of riverway. It is known for its striking desert mountainous terrain and deep-cut canyons. In 1996, the park received 281,818 visitors (MacIntyre, 1998). Primary activities include hiking, camping, rafting, and viewing nature and scenery.

United States Fish and Wildlife Service. USFWS has management responsibility for biological resources throughout the area. Sevilleta National Wildlife Refuge (NWR), Bosque del Apache NWR, and San Andres NWR are specially managed for wildlife protection. The Bosque del Apache NWR receives approximately 135,000 visitors annually.

Bureau of Land Management. BLM manages extensive areas within the region for multiple use. Activities managed by BLM include grazing, mineral exploration and

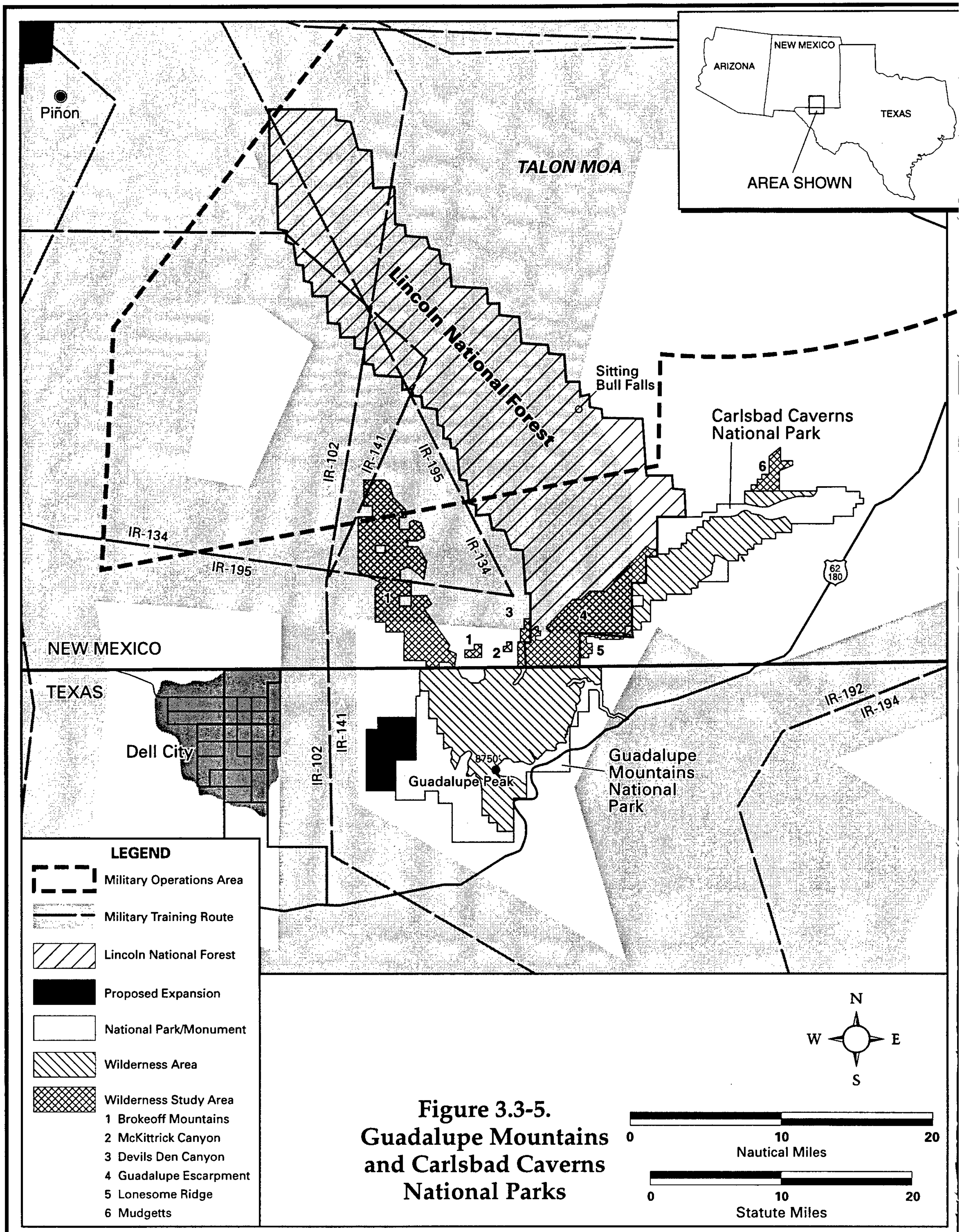

Figure 3.3-5. Guadalupe Mountains and Carlsbad Caverns National Parks

development (leasable, locatable, and salable mineral realty), realty, cultural resource conservation, wildlife habitat and endangered species conservation, and recreation.

BLM has several special management areas within the region that are designated to recognize, protect, and manage unique or sensitive resources. For example, these may be valued as visual, cultural, biological, natural, geological, recreational, or scientific resources. These areas include Wilderness Areas and National Conservation Areas (NCAs) that are designated by act of Congress, and WSAs and Areas of Critical Environmental Concern (ACECs) that are administratively designated through a land use planning process. The El Malpais NCA, which includes Cebolla and West Malpais Wilderness Areas and El Malpais National Monument, is also within the affected region.

Under the Federal Land Policy and Management Act (FLPMA) of 1976, BLM is directed to identify ACECs. ACECs are identified in local Resource Management Plans (RMPs). Specialized management plans are prepared for each ACEC, aimed at protecting their unique resource values. Five ACECs underlie one or more MTRs. These ACECs and their unique resources include: Three Rivers Petroglyphs (cultural and recreation), Cornudas Mountain (cultural and visual), Alamo Mountain (cultural and visual), Alkali Lakes (biological), and Wind Mountain (visual and cultural) (USDOI, 1997). Similarly, several WSAs have been identified within the region that are recommended for wilderness designation, including Little Black Peak, Carrizozo Lava Flow, Jornada del Muerto, Sierra de las Canas, Continental Divide WSA and National Trail, Sierra Ladrones, and Petaca Pinta. WSAs are managed under the *Interim Management Policy and Guidelines for Lands Under Wilderness Review*, so that areas will not experience degradation of wilderness qualities before a final decision on their wilderness status is made.

Native American Reservations. Native American reservations underlying affected airspace include Acoma Pueblo, Ramah Navajo, Alamo Navajo, Laguna, the southeast tip of Zuni, and northwest portion of the Mescalero reservations (Figure 3.3-6). Most of the reservation lands are used primarily for sheep farming. There are also isolated dwellings and home-based industries throughout reservation areas. Sensitive sacred sites and areas used for traditional activities are discussed in Section 3.6, Archaeological, Cultural, and Historical Resources.

Department of Defense Land. Target and impact areas used by Holloman units within WSMR include Yonder, Red Rio, and Oscura. These areas are located along a broad central axis, with adequate safety areas to contain ordnance used for training within the installation. Under an interservice support agreement, the U.S. Air Force maintains these impact areas for tactical training and keeps them cleared of UXO and debris. WSMR has a number of cooperative agreements, programs, and memoranda of understanding (MOUs) governing co-use areas on the installation, including San Andres NWR (managed by USFWS), White Sands National Monument (managed by NPS), Trinity Site National Historic Landmark, and Eugene Manlove Rhoades Gravesite (managed by WSMR). Public access is only permitted onto the installation for scheduled hunts permitted by the New Mexico

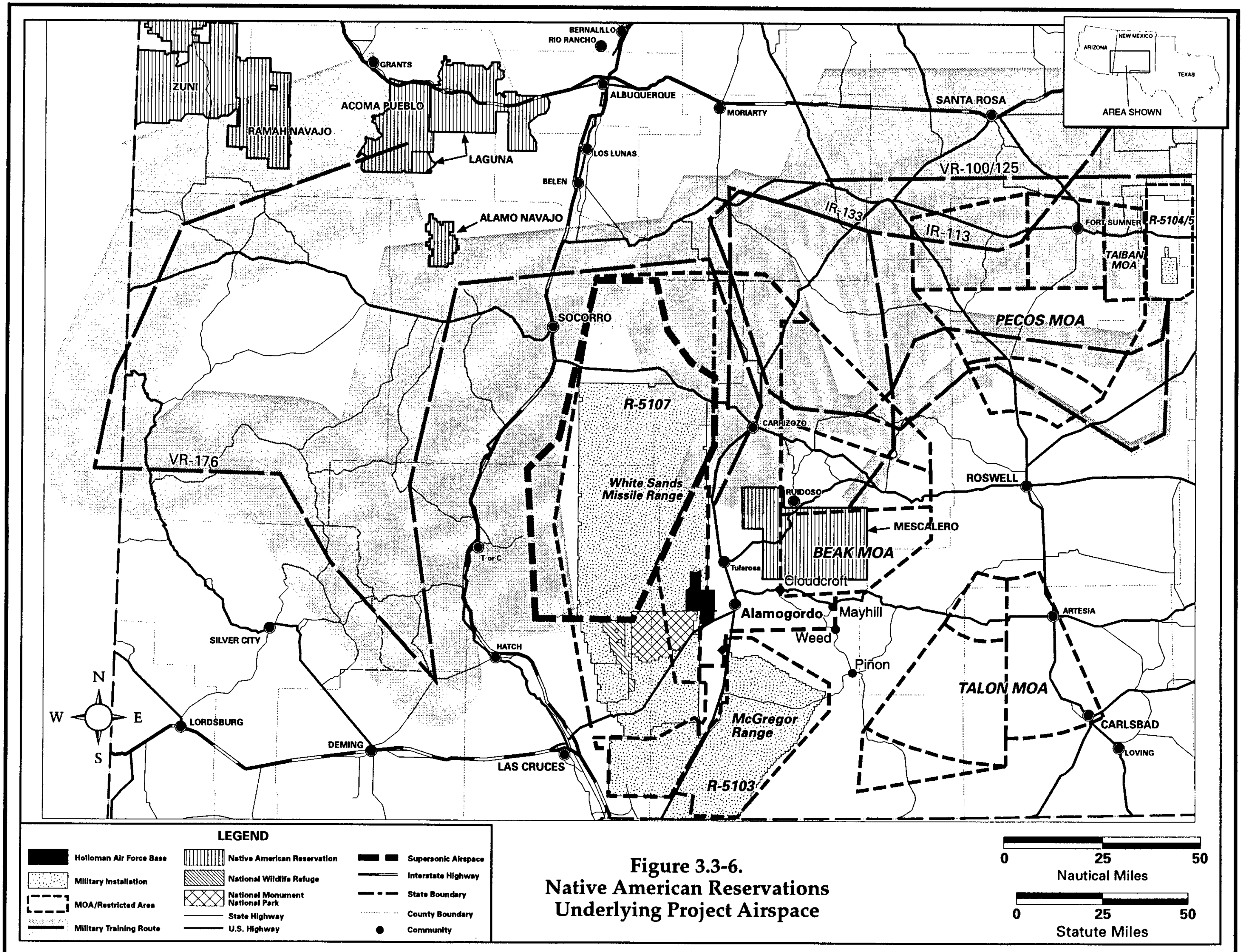

Figure 3.3-6.
Native American Reservations Underlying Project Airspace

Department of Game and Fish (NMDGF) (managed and monitored by military police) and two days per year to visit the Trinity site.

The Yonder impact area, comprised of about 215,000 acres, is located in the west-central portion of WSMR, partially within the San Andres Mountains. Portions of the Yonder Area in the valley floor are within a designated hunting area and are accessible for scheduled public hunts (U.S. Army, 1985).

The Oscura impact area, including a safety area, occupies 57,120 acres of desert floor in the northeast portion of WSMR (Montague, 1997). The area is used by Air Force units for air-to-ground gunnery and strafing practice (U.S. Army, 1985).

The Red Rio impact area is located in the far northeast portion of WSMR, just south of U.S. 380. The impact area, including a safety area, occupies about 55,680 acres in an oval configuration in the foothills of the Oscura Mountains (Montague, 1997). The impact area is used for tactical air-to-ground training (U.S. Army, 1985). Since 1994, a live munitions target has also been used at Red Rio. Approach angles for these deliveries are restricted to limit safety hazards to areas beyond the safety area. Little Black Peak and Carrizozo Lava Flow WSAs and Valley of Fires Recreation Area are located within eight NM of the Red Rio impact area but do not directly underlie patterns and approaches to targets.

Melrose Range is located in Roosevelt County, New Mexico, and is associated with R-5104 and R-5105. The range occupies approximately 88,000 acres and is used primarily by units operating out of Cannon AFB, located about 35 miles east of the range. About 49,000 acres of the range are out-leased for livestock grazing (Montague, 1997). Dry crop farming is permitted in the northern part of the range. Some areas in the north part of the range are being converted to natural grassland as part of a natural resource management program. Restrictive easements on about 1,500 acres of the range limit grazing, oil and gas exploration activities, and building dimensions in order to facilitate mission requirements (U.S. Air Force, 1995).

The surrounding areas include open rangeland used for livestock grazing and limited agriculture. Several small communities are located beneath the restricted airspace and within 10 miles of the range boundary, including Taiban, Tolar, and Melrose. A few residences are scattered throughout the area, associated with agricultural and ranching activities. Roosevelt and Curry counties have no zoning ordinances that restrict land use surrounding the range.

Other Federal Land. The National Radio Astronomy Observatory, under the auspices of the National Science Foundation, established the Very Large Array (VLA) of radio telescopes located on the Plains of San Augustin in Socorro County. The antennas are about 90 feet high and move along several miles of rail tracks to create different receiving configurations. The U.S. Department of Agriculture operates the Jornada Experimental Range (JER), which is about 193,000 acres directly west of WSMR and north of U.S. 70.

State of New Mexico. The State of New Mexico owns and manages extensive land in the affected area that is primarily leased for grazing and mineral activity. Several state parks and state wildlife/waterfowl refuges underlie affected airspace (see Appendix E).

State of Texas. The State of Texas owns lands underlying MTRs in west Texas. Most of the land is leased to ranchers for cattle grazing. Sierra Diablo Wildlife Management Area (WMA), managed by the Texas Parks and Wildlife Department (TPWD), and Chinati Mountain Property, which is planned as a recreational area, partially underlie affected airspace.

State of Arizona. An area of state-owned lands north of Apache-Sitgreaves National Forest along the New Mexico border is used primarily for grazing.

Private Land. Extensive areas of privately owned land are generally undeveloped rangeland used for livestock grazing and some agriculture. Other farming activities in the region include horse and llama breeding, and ostrich/emu and dairy farms. These are generally located close to communities. Interspersed are several small communities and isolated homesteads. Many communities in southern New Mexico, particularly in mountainous areas, are popular for seasonal vacationing and as retirement destinations because of their natural and quiet settings. Figures 3.3-3 and 3.3-4 show some of the communities underlying training airspace throughout the region.

At a minimum, overflight of rural communities is avoided below 1,000 feet AGL. Overflight of people, vehicles, and structures in noncongested areas is avoided by a minimum of 500 feet vertical or lateral distance, in accordance with Federal Aviation Regulation Part 91 (FAA, 1992) and AFI 11-206 (U.S. Air Force, 1994b).

3.3.1.4 McGregor Range

The proposed action would potentially affect the use of areas within McGregor Range. A brief land use history and current land use conditions of this range and surrounding areas are described below.

McGregor Range is part of Fort Bliss Military Reservation, located in Otero County, New Mexico. Geophysically, the range is comprised of areas within the Tularosa Basin to the south and west, Otero Mesa and its escarpment to the east and north, and the foothills of the Sacramento Mountains in the far north part of the range. McGregor Range is comprised of 697,472 acres, of which 71,083 acres are owned in fee by the U.S. government and managed by the Department of the Army, 608,385 acres were withdrawn for military use under the Military Lands Withdrawal Act (MLWA) of 1986 (PL 99-606), and 18,004 acres within Lincoln National Forest are managed by USFS and used by the Army through a Cooperative Agreement. The MLWA includes provisions for renewing the withdrawal after 15 years (in the year 2001), or if the Secretary of the Army determines that there is no further military need, for relinquishing the withdrawn lands to the Secretary of the Interior. The withdrawal is scheduled to expire on November 6, 2001. The U.S. Army proposes to

rewithdraw McGregor Range; a draft EIS on this proposal is expected to be issued in 1998.

Historically, the McGregor Range land area, which includes portions of Tularosa Basin, Otero Mesa and the Sacramento Mountain foothills, has been used by aboriginal peoples, Spanish explorers, early homesteaders and cattle ranchers, and the U.S. military. The Sacramento Mountains were the preferred settlement area for the Mescalero Apache people, who used the Tularosa Valley and foothills for hunting and gathering of food, and for mineral resources (Sonnichsen, 1968; Basehart, 1974). Early Spanish expeditions in this area between about 1650 and 1850 met with opposition from the Mescaleros, and eventually resulted in treaties that included a reservation for the Mescalero. After acquisition of the area by the United States in 1848, American military expeditions criss-crossed the Tularosa Basin. The government encouraged settlement of the region and both military and early settlers facilitated a strong presence for each other in the region (Sanders, 1992; Otero County, n.d.)

With the establishment of Fort Stanton in the Sacramento Mountains in 1855, cattle ranchers moved into the McGregor Range area to find relief from overcrowded rangeland further east (in the Pecos Valley and west Texas). Pockets of agricultural activity were confined to river and stream valleys where water was available. Over the last 100 years, this area, including Otero Mesa, has continued to be used primarily for cattle operations, military uses, and supplemental food gathering and hunting by the local population (Sanders, 1992; Faunce, 1995). More recently, the area has also been used recreationally.

A series of land purchases by the U.S. Army and withdrawals of public domain lands beginning in the 1940s allowed use of WSMR (formerly White Sands Proving Grounds) and McGregor Range for military purposes. (Additional information on land settlement within McGregor Range is included in Section 3.3.1.5, Grazing.) Review of newspaper articles and historical reports indicates that many land owners and local citizens resisted these withdrawal actions (Sanders, 1992; Faunce, 1995).

Under MLWA, the Secretary of the Interior manages nonmilitary uses of the withdrawn lands of McGregor Range, including hunting and recreation, wildlife habitat management, and grazing, with approval from the Army. However, the Secretary of the Army has the authority to limit public access to the range for the purpose of military operations, public safety, or national security. BLM (Las Cruces District) manages daily nonmilitary uses of the withdrawn land, within the parameters defined by the Department of the Army. In accordance with MLWA and Section 202 of FLPMA, BLM has developed a Resource Management Plan Amendment (RMPA) for McGregor Range, and entered into an MOU between the Secretary of the Interior and the Secretary of the Army in 1990 to implement the plan. The RMPA includes management objectives for lands, realty and access, mineral resources, soils, water, and air, livestock grazing, wildlife habitat management, limited recreation, visual resources, and wilderness, cultural resources, and fire management.

Through cooperative agreement with USFS, as amended in 1977, portions of McGregor Range within Lincoln National Forest (18,004 acres) can be used as a secondary safety area for missile launches and for ground troop training. This area is used primarily for grazing and some recreational hunting. Occasionally, the area is closed to the public when missile launches on McGregor Range require additional safety areas. Uses are coordinated with USFS to ensure that public and employee access is appropriately restricted when the safety area is activated.

Since the 1986 withdrawal, McGregor Range has been divided into an area which is only used for military operations (about 426,000 acres, mostly within the Tularosa Basin), and grazing areas (271,000 acres, including basin areas, Otero Mesa, and Sacramento foothills) in which nonmilitary uses can occur to the extent that they do not interfere with military missions (Figure 3.3-7). These areas were defined for safety concerns and to provide flexibility and security for the Army to perform its mission.

The primary military use of McGregor Range is to support a variety of Army missions. The southern part of the range is used for ground maneuvers. Meyer Range in the south part of the range has several small arms training ranges. McGregor Base Camp is also located in the south half of the range, and is the center of range support activities. In proximity to the camp are the Range Control facilities at Davis Dome and a series of missile firing sites, used primarily for long-range PATRIOT and HAWK missile firings. Most of the north half of the range is primarily used for missile firings with most impact areas confined to the Tularosa Basin and safety areas extending to the north on Otero Mesa and foothills of the Sacramento Mountains. Located on the west side of the northern half of McGregor Range are Orogrande Range and SHORAD Range, used for short-range air defense missile firings and laser operations. Aerial targets such as drones are frequently used over the impact area. Other activities on McGregor Range include Roving Sands exercises and training activities by other Federal agencies.

Currently, Holloman AFB units use a conventional target in the northwest corner of McGregor Range, north of State Road 506, within grazing unit 2 (see Figure 3.3-7). The target area was constructed in 1989. The area immediately around the targets (about 20 acres) is fenced to exclude livestock.

Access to McGregor Range is controlled by the Army. All persons are required to coordinate access and use with the Range Commander (through the Range Scheduling office) to ensure safety and to avoid interference with military missions. This procedure applies to government employees, contractors, and the public at large. Current access procedures do not allow concurrent use of any portion of the range for a military mission (including range maintenance and resource survey activities) with public recreational use. Members of the public must obtain annual recreation access permits from either the Army or BLM. About 1,600 permits are issued annually for purposes such as livestock management, hunting, hiking, habitat management and conservation activities, and guided nature tours. Permit holders are responsible for complying with specific Army and BLM procedures for entry, use, and departing the range. Information from interviews and access logs

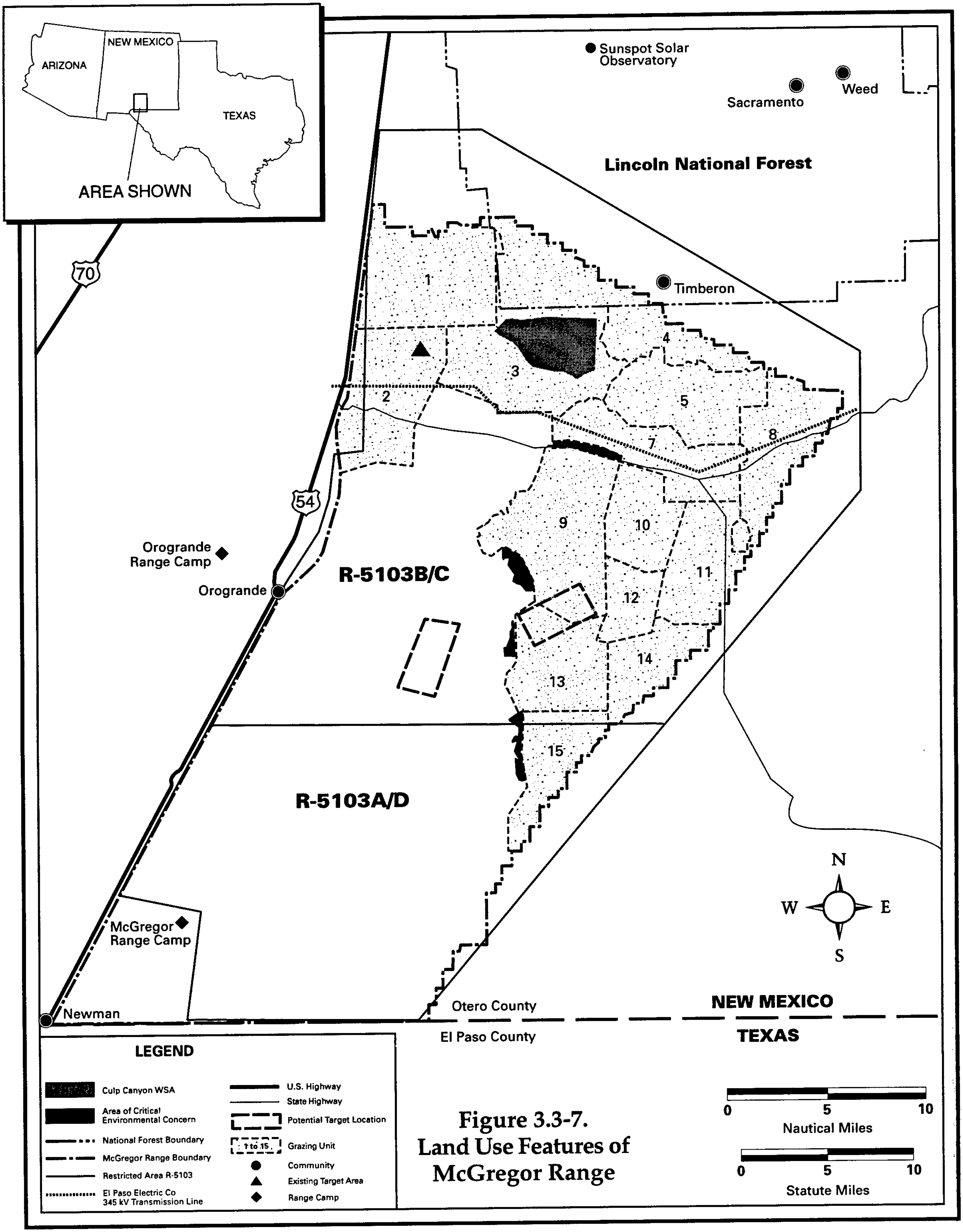

Figure 3.3-7.
Land Use Features of McGregor Range

indicate that during hunting seasons, access by about 10 persons per week may be recorded on McGregor Range. At other times, official access to the range for public recreation is infrequent (Grossenheim, 1997).

The entire range is closed on average two weekdays each week for missile firings during September through November, for five days in the spring for Roving Sands, and for three days in the spring for live-fire exercise. Ground troop and special training maneuvers are conducted throughout the foothills in grazing areas 12, 13, and 14. Laser operations and other activities result in general closure to public access for about an additional month or two each year. Use of the existing target by Holloman units results in restricted access to grazing units 1 and 2 for recreational uses. Portions of the range may also be closed for a variety of environmental management and range maintenance tasks throughout the year. Overall, military operations result in restricted public and BLM access to grazing areas about one-half of the time (Bankston, 1997). Closures generally occur on weekdays, although additional time throughout the week is scheduled by the Army to perform maintenance and environmental surveys, studies, and management.

State Road 506 traverses the north end of the range, providing access from U.S. 54 to small communities and ranches north and east of the range. Permits are not required to use this roadway. However, because the highway is on withdrawn land, the Army restricts access along the route when military operations may cause unsafe conditions. At these times, three access gates are manned by Range Riders[1] and Military Police for the duration of the closure. Currently, the road is usually closed for two or three days each week during missile launches in September through November. A closure schedule is distributed twice monthly to local ranchers and the Fire Department in the community of Timberon.

El Paso Electric Company has an easement for a high voltage (345 kilovolt [kV]) electric transmission line across the north end of McGregor Range. Easements are not required for infrastructure constructed by the Army within McGregor Range, such as telephone or utility distribution lines. However, easements are needed for new telephone or utility lines originating off-range that enter onto the range. Easement applications on withdrawn land are generally processed and granted by BLM with Army concurrence (Creager, 1996).

In 1993, Otero County adopted an Interim Land Use Policy Plan, and is now developing a Comprehensive Land Use Plan. The primary goal of the policy plan is to guide the use of public lands and resources in the county and to protect the rights of private land owners. Several reports and draft portions of the comprehensive plan identify areas of historic and customary use of value to county residents, including use of water, agriculture, livestock grazing, timber and wood production, mineral production, cultural resources, recreation, hunting, federal and military activities, transportation and access, wilderness, wildlife and threatened and

[1] Range Riders are civilian employees whose diverse functions include: enforcement of Army, Federal, state, and local regulations on Fort Bliss; safety of persons on the Range; and Range conservation activities and firefighting services.

endangered species. Specific to McGregor Range, the county supports multiple use of federal lands, maximizing livestock production, maintaining access along State Road 506, and recreational use for hunting, hiking, and observing nature. Mineral and geothermal resources are available for public exploration or extraction under the RMPA at the discretion of the Army (PL 99-606). No timber resources are present on McGregor Range. The county has also adopted Ordinance 93-04, based on NEPA, regarding desired county involvement in the Federal NEPA process.

Mineral Use. Under PL 99-606, the withdrawn lands of McGregor Range were withdrawn from use under the mining laws, and mineral and geothermal leasing laws. Any application to BLM for exploration, extraction, or production of locatable minerals (such as gold, zinc, and copper), salable minerals (such as sand and gravel), and leasable minerals (such as oil, gas, and geothermal resources) on withdrawn land would have to be approved by the U.S. Army prior to BLM's processing and granting the application. Since the 1986 withdrawal, the Army has not approved opening any portion of McGregor Range for mineral uses.

A recent assessment of mineral and energy resources on McGregor Range was conducted jointly by staff of the New Mexico Bureau of Mines, New Mexico State University, and TRC Mariah Associates, Inc. (NMBMMR et al., 1997). This study indicates that small amounts of various metallic (locatable) minerals are present on McGregor Range, but economic potential is low, particularly compared to moderate potential in the nearby Jarilla Mountains to the west of the range.

Industrial (salable) minerals and materials (such as sand, gravel, limestone, caliche, and gypsum) are available in large amounts throughout the region and are currently produced from several active quarries. These resources also occur widely on McGregor Range. Some Army construction projects on McGregor Range use sources of industrial materials located on the range. These are not treated as mineral sales (Solas, 1998), but do require coordination with BLM in order to approve the proposed use and to identify suitable borrow or quarry sites. Any construction procedures or site remediation standards for these actions are also coordinated between the U.S. Army and BLM. In some cases, materials are purchased and transported from off-site sources onto the range for construction activities (Gatewood, 1998).

Energy resources in the region potentially include geothermal resources, oil and gas, and uranium. McGregor Range lies within the Rio Grande Rift (RGR) valley, characterized by crustal instability that can have underground geothermal reserves with high heat-flow in young igneous rock formations. Current investigations by the U.S. Army near McGregor Range Base Camp indicate moderate potential for limited use of geothermal resources either for limited production of electricity for local energy users (essentially on McGregor Range) or for local space heating purposes. Geothermal potential elsewhere on the range is considered low. The McGregor geothermal system is one of 27 known hydrothermal systems within the southern RGR (NMBMMR et al., 1997).

The extent and quality of oil and gas resources on McGregor Range is not fully known. Various reports and exploratory drilling in the 1970s and 1980s provided mixed findings about the presence and potential of commercial-sized oil or gas reserves in the Tularosa Basin. Numerous exploration wells drilled in the Fort Bliss area in 1980 were dry (U.S. Geological Survey, 1981). Exploratory drilling on Otero Mesa has been disappointing, and interpretation of geologic conditions for hydrocarbons has been unfavorable (Black, 1975; King and Harder, 1985). Because of geologic activity during the development of the RGR and results of exploration, it is probable that if oil and gas resources exist on McGregor Range, they are likely to be small. A previous study of statistics of drilling defined "small" as less than 10 million barrels of recoverable oil, or 60 billion cubic feet of recoverable gas (Johnston, 1980). Areas on McGregor Range identified with moderate petroleum resource potential in the recent Mineral Assessment generally include grazing units 1, 2, 3, and 4, and the south part of the range. Recent discovery of gas from a well on Otero Mesa to the east of McGregor Range has prompted the nomination of about 30,000 acres of BLM lands for exploration (Sanders, 1998; Jensen, 1998). It is not yet known whether production of newly discovered gas reserves will be economically feasible. Prior to leasing, BLM would undergo a series of resource planning and environmental analyses (Jensen, 1998).

The Grants mineral belt in northwest New Mexico is the nation's largest producer of uranium (DOE, 1980). Decreasing demand, however, forced all conventional mines in the state to close in the early 1980s (McLemore and Chenoweth, 1989). Uranium minerals have been reported from several areas at and near McGregor Range, but uranium deposits are not known from the range. The potential to develop commercial quantities of uranium at these sites or elsewhere in the region is low, considering that highly favorable areas exist elsewhere in New Mexico.

Recreational Use. Both licensed antelope and deer hunts are conducted annually on McGregor Range. These hunts are managed by NMDGF in accordance with U.S. Army procedures. In the early 1990s, a deer hunt was canceled due to a military mission. Public concern prompted coordination of hunting schedules between NMDGF and the Army well in advance to ensure that hunts can occur without conflict with military activities. Since this coordination was started, no hunts have been canceled for military uses, although they have not been scheduled when deer populations have been too low (Goodwin, 1997).

Otero Mesa has antelope herds of trophy quality, and antelope hunts are restricted to muzzle-loading guns and bow hunting. A portion of McGregor Range corresponding to BLM's grazing areas on Otero Mesa, south of State Road 506, is part of Antelope Management Unit 29 of NMDGF. Unit 29 extends to the east of McGregor Range and is comprised of about 536,000 acres, of which the McGregor Range portion is about 111,000 acres.

The number of licenses issued for both antelope and deer hunts is based on herd size. Currently, 95 licenses are being issued for the Unit 29 antelope hunt, conducted annually in September, of which 20 are assigned to the McGregor Range portion. Current numbers of licenses are typical of recent years, although prior to the

drought that has persisted through the mid-1990s, about 195 licenses was typical (Madsen, 1997a).

Similarly, deer hunting on McGregor Range is part of Big Game Management Unit 28, located on McGregor Range only. Currently, 50 licenses are issued for public deer hunting in Unit 28, north of State Road 506 (including portions in Lincoln National Forest), and 20 licenses are being issued for DOD personnel only, in areas along the Otero Mesa escarpment south of State Road 506. Deer hunting east of McGregor Range is part of Big Game Management Unit 29 and licenses are issued on a call-in basis, in accordance with herd size. Deer hunts are usually held in late October or early November.

In addition to scheduled hunts, opportunities for game bird hunting occur north of State Road 506. Other recreational use of grazing areas includes hiking and observing nature. Offroad vehicle use is permitted only on roadways and established trails on McGregor Range.

Special Management Areas. The McGregor Black Grama Grassland ACEC is comprised of four separate stands of black grama grasses located along the Otero Mesa escarpment and State Road 506 (USDOI, 1990). The ACEC is maintained and managed jointly by BLM, New Mexico State University, and Fort Bliss through cooperative agreement. This agreement recognizes these areas for their value to ongoing desert grasslands research. The location of these areas is shown in Figure 3.3-7. These areas are fenced to prevent cattle from grazing in the ACEC. Public organizations may conduct educational tours of the ACEC.

Culp Canyon WSA, comprised of 10,937 acres, is located north of State Road 506 within McGregor Range, and south of the Lincoln National Forest boundary. The area is managed under *the Interim Management Policy and Guidelines for Lands Under Wilderness Review* to prevent impairment of wilderness value. This WSA is not currently recommended for wilderness status due to military use (USDOI, 1991); occasionally, ground troop maneuvers are conducted in this area. The WSA falls within grazing unit 3, which was last grazed in 1995.

Areas adjacent to the range to the east are primarily public lands with some state and private holdings, used for livestock grazing. A few homesteads are located along the eastern boundary. Many of the ranching families in the area have been residents and users of the land since before the establishment of McGregor Range. To the northeast and north are the Sacramento Mountains and Lincoln National Forest (Sacramento Mountains district). The community of Timberon partially underlies R-5103B. There are about 5,200 property owners in this area, with about 350 permanent residents, and an additional 200 summer residents. The community has an airstrip, fire station, general store, golf course, tourist lodgings, and elementary school (Roberts, 1996). To the southwest of McGregor Range is Doña Ana Range on Fort Bliss Military Reservation, used primarily for artillery and tank maneuvers. To the northwest is public land managed by BLM and used for grazing, and some undeveloped private land.

3.3.1.5 Grazing

Grazing is the dominant land use and a primary source of income for some people in the region. Public comments identified concerns about the potential impact of an NTC and associated low-level military aircraft operations on ranching. This section briefly summarizes the history and conditions of the grazing industry in the region, and provides information about grazing operations on existing air-to-ground ranges in the area and McGregor Range.

A long history of grazing throughout the area is closely tied to early settlement of the Southwest. Originally, settlers generally established a formal claim for land around a spring where a homestead would be built, and cattle would graze on surrounding unclaimed public domain areas, as was the practice in Mexico. Several Presidents supported colonization and liberal sales and grants of settled areas to the land users. By the end of the nineteenth century, speculative land practices and depletion of timber and other resources prompted Congress to repeal this policy, and to set aside "national forest lands." Subsequently, in 1934, under the Taylor Grazing Act, the remaining unclaimed federal lands were put under the management of the Department of the Interior. During this time, livestock grazing continued on federal lands, and regulations evolved allowing these practices to continue. A permit system evolved that recognized priority in occupancy and use of rangeland; grazing permits for specific parcels of land remained with individuals (Otero County, n.d.).

In recent years, financial viability of livestock operations in the region has been affected by a series of impacts including drought, reductions in beef prices, reduced availability of public lands for grazing due to environmental concerns, increased administrative and regulatory requirements of land managers, and grazing allotment reductions. Cumulatively, this has had the greatest impact on ranches with large debt loads. In addition, the Farm Services Administration is considering a reduction in its guarantee to lending institutions from 90 to 60 percent, further affecting the ability of ranchers to renew loans or to find new lenders (Thal, 1997a; 1997b).

An estimated 321,505 animal unit months[1] (AUMs) were available in Otero County in 1995, of which 144,547 AUMs were on public land administered by BLM, and the rest were on Forest Service, state, and private land. There were 89 cattle ranches within the county (including six with sheep as part of the livestock), of which 41 operated at above a break-even point. Ranching operations included 36 extra-small ranches (less than 50 head), 10 small (50 to 99 head), 19 medium (100 to 249 head), seven large (250 to 499 head), and 17 extra-large ranches (with more than 500 head). Only one of the extra-small operations operated above break-even point, indicating the financial marginality of small-scale operations (Thal, 1997a; 1997b).

[1] An animal unit month is based on the amount of forage for one animal unit for one month. An animal unit equals one head of cattle, or a cow/calf combination, or specified number of yearlings.

The original land acquired for McGregor Range in the 1940s and 1950s was mostly comprised of public domain areas. Several ranchers in the areas owned small properties in-fee, and held grazing permits for extensive portions of public land. The Army negotiated with ranchers for the use of the public lands for four days each week. Most ranchers considered three days as inadequate to work a ranch and favored "selling" their grazing permits to the Army. A few ranchers were strongly opposed to losing use of public lands and their homesteads, and condemnation of some properties ensued. In addition to acquiring grazing rights, a portion of the current McGregor Range within the Tularosa Basin was officially withdrawn for military use in 1957 under Public Land Orders 1470 and 1547 (Faunce, 1995).

From this time until the mid-1960s, grazing was suspended on McGregor Range, but trespass grazing continued because there were no fences, and it was impossible for the Army to patrol the large area. BLM became manager of the nonmilitary uses of the range and permitted cattle grazing beginning in 1965 (Faunce, 1995). After expiration of the original withdrawal, the DOD and the Department of the Interior entered into an MOU that allowed the U.S. Army to continue to use the land as they had since 1957. Subsequently, Congress formally withdrew about 608,385 acres of public land for military use in 1986 under MLWA. Under terms of the withdrawal, some grazing has been permitted on a non-interference basis with military missions. The Army has identified areas that have relatively low safety risk from prior military operations (e.g., UXO and debris) that have been opened up to grazing.

As agreed in the MOU, BLM manages the grazing program and authorizes livestock grazing. There are 14 grazing units managed by BLM (271,000 total acres) within McGregor Range (see Figure 3.3-7) that currently support about 2,900 cattle annually. BLM employees perform maintenance of fences, corrals, and water pipelines, assess range conditions, and decide appropriate levels of grazing for each unit. For the 1996/1997 grazing period, about 22,350 AUMs were allocated on 13 active grazing units. This represents an annualized allocation, based on a total of about 39,700 AUMs that were under contract with varying contract durations.

In 1965, BLM established an auction system for grazing units on McGregor Range, unlike the priority system that prevails for most public lands. This was enabled by the Army's purchase of the grazing permits in the 1950s. Money collected from grazing fees goes into a fund to directly pay for the costs of running the program. These units are valuable due to extensive range improvements, high quality forage, and the availability and delivery of Army-owned water through an extensive pipeline system that was constructed and maintained by ranchers and BLM over several generations. There are about $4.6 million of improvements in the form of water pipelines, holding tanks and troughs, corrals, wells, fences, and windmills (Christensen, 1996).

Tasks performed by BLM include repairs to water pipelines, corral and fence maintenance, evaluation of rangeland condition, and assistance with moving cattle onto and off the range. Currently, a three-man Range Management team performs these functions, spending about 80 percent of their time on Otero Mesa and the Sacramento Mountain foothills grazing units. An estimated 60 to 80 hours per

week are spent on maintenance activities on grazing units south of State Road 506. Over half of an average week is spent on pipeline maintenance. A phased program to replace old pipeline has been intermittent and dependent on funding. Congressional appropriation in the early 1990s allowed about half the links to be replaced, resulting in reduced upkeep for new portions. Most of the waterlines on Otero Mesa have not yet been replaced and still require considerable maintenance. These lines are checked for leaks and damage about twice each week (usually Mondays and Fridays). The minimum amount of time needed to check water lines south of State Road 506 is about six to eight hours. Two persons working simultaneously can reduce the window needed to about three to four hours. Additional time is required for repairs (Christensen, 1997).

In addition to day-to-day maintenance, BLM assists ranchers with bringing cattle onto the range in October, and taking them off in March or July (depending on the period of specific grazing contracts). It takes between one and seven days to move cattle onto or off different grazing units (depending on size and location of the unit and condition of the cattle). Cattle cannot be moved to and from all the grazing units at the same time; therefore, it can take several days during these months to move cattle. Military operations are generally coordinated between the Army and BLM to allow ranchers to bring cattle onto the range or take them off. Ranchers can usually perform these tasks with few conflicts with current military activities (Christensen, 1996). Several corrals are used for staging cattle during round-up times, and for housing sick cattle at other times of the year. Under current management, many lessee ranchers only perform intermittent caretaking of their cattle during most of their contract period. However, the amount of time individual ranchers spend in tending cattle varies widely.

Because BLM provides water and maintenance services that are not usually included in grazing contracts, this area is desirable and operable for out-of-state ranchers as well.

The average grazing cost per AUM varies on public and private land. The total cost per AUM includes non-fee costs that a rancher must invest in cattle operations and other fees. Other fees include lease rates (for private contracts), grazing fees, and permit costs (for BLM contracts). A study conducted by New Mexico State University on competitive pricing for McGregor Range indicates that non-fee costs to ranchers on McGregor Range are less than costs to ranchers on private or other BLM rangeland. For example, in 1992, non-fee costs for operations averaged $12.80 per AUM on private land, $16.16 on BLM rangeland, and $11.90 on McGregor Range grazing units. On McGregor Range, BLM provides services and investments that ranchers usually absorb, such as monitoring and managing range conditions, water, repairing and investment in improvements. Beyond these non-fee costs, the average lease rate per AUM on private land was $6.88 (for total cost of $19.68 per AUM). The average grazing fee and permit cost per AUM on BLM land was $1.92 and $2.98, respectively (for total cost per AUM of $21.06). In 1992, the average total estimated cost per AUM on McGregor Range was $16.78, including a bid price of $4.88 per AUM (difference between the total cost bid per AUM and non-fee operating costs per AUM). Fluctuations in bid prices over time indicate that the

value of AUMs (lease rate) on McGregor Range varies in an open market. External conditions, particularly drought, have been correlated to dramatic increases in what ranchers have been willing to pay for good grazing conditions (Fowler et al., 1994).

Current bid prices (lease rates) per AUMs on McGregor Range vary between $11 and $16.75 per AUM (Aguirre, 1996). Eight of 14 units were bid with a total bid value of $186,077.83. Payments for four units on 18-month contracts and one unit on a 42-month contract contributed an additional $111,044.40 for a total FY97 collection of $297,122.23. Because the units are bid at auction, they do not necessarily stay with the same rancher, as they do with most BLM grazing permits. In the last five years, only two units (units 4 and 5) were leased by the same rancher, and these units were only available for two years. Most units had two or three different lessees, and three units had up to four different lessees. Over half the contracts were with ranchers in New Mexico, about a quarter with ranchers out of Texas, about 17 percent from Arizona, and the remainder from Colorado and California. Currently, 10 grazing units are held by out-of-state lessees, mostly from west Texas. Three units are held by in-state lessees, of which one is categorized as an Otero County ranch operator by BLM. The ranching operations of these lessees have a minimum of 200 head of cattle, up to several thousand (Christensen, 1997) and would therefore be categorized as medium, large, and extra-large operations (Thal, 1997a; 1997b).

The U.S. Army has annual rights to about 110,000 gallons per day (gpd) of water from the Sacramento Mountains and Carrizozo Springs that is used for wildlife conservation and range management (New Mexico State Engineer's Office, License 01657, August 1963). Currently, cattle benefit from this water delivered via pipeline to watering tanks on McGregor Range.

Grazing operations are currently ongoing at various existing air-to-ground ranges throughout the U.S., including one (Melrose) in the local region. At Melrose Range, grazing is permitted on 49,000 acres surrounding a 10,000-acre impact area (Montague, 1997). This area supports about 1,270 animal units each year, where each animal unit is comprised of a cow and a calf, or three yearlings. The lease rate for AUMs is about $3.30, based on $40 per animal unit. Ranchers provide their own improvements, water, and perform all maintenance and livestock management tasks. Similar to other BLM rangeland, grazing permits are held by the same ranchers every year. Grazing is not permitted in the impact area due to safety concerns. Because much of the grazing area is within safety footprints for munitions expended at the range, ranchers are only allowed onto the range between 10:00 pm and 7:00 am daily. Most training maneuvers begin at about 9:30 am, giving ranchers additional time on the range for management activities. There have been no injuries to ranchers or cattle from air-to-ground training operations (Crowe, 1997a).

There is no domestic livestock grazing on WSMR. Although much of the land area was previously grazed prior to the 1945 public land withdrawal, grazing was determined to conflict with military testing and the security mission of WSMR and was discontinued. All privately owned land within the range (formerly used with BLM grazing permits) has also been acquired for exclusive military use (U.S. Army, 1985).

3.3.2 Projected Baseline FY00 Conditions

3.3.2.1 Holloman AFB

In FY00, there will be a slight increase (about two percent) in the area exposed to noise levels of 65 dB above FY95 conditions. However, most affected locations on the base will experience imperceptible reductions or no change in noise levels. Figure 3.2-2 illustrates the extent of noise exposure in FY00.

Possible construction on-base by FY00 would include a new dental clinic, a War Readiness Materiel warehouse, and a Learning Center. These would all be constructed within existing developed areas with similar surrounding functions. On-base land uses would be unchanged from FY95 conditions.

3.3.2.2 Vicinity of Holloman AFB

Little change in land use in areas surrounding the base is anticipated by FY00. Additional residential development is occurring in and around Alamogordo. As shown in Figure 3.2-3, the area exposed to noise levels of L_{dn} 65 dB and above will contract in length but widen to the southwest of the base. The off-base area exposed to these levels will be about 21.7 square miles, of which about 1.38 square miles will be privately owned. Average noise levels at the White Sands National Monument headquarters and visitor center will decrease slightly. Slight increases in noise along the eastern boundary of the monument will be imperceptible. Overall, the total area exposed to L_{dn} 65 dB and greater at the monument would decrease slightly (by about 50 acres) from FY95 conditions.

3.3.2.3 Areas Underlying Affected Airspace

Overall land use patterns are not anticipated to change by FY00 for areas underlying military training airspace. Federal agencies will continue to implement land management actions in accordance with current RMPs. These will generally support continued multiple-use and protection of wilderness and special management areas.

3.4 AIR QUALITY

Air Quality Standards. Under the authority of the CAA, the EPA has established nationwide air quality standards to protect public health and welfare, with an adequate margin of safety. These Federal standards, known as the National Ambient Air Quality Standards (NAAQS), were developed for six "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), sulfur dioxide (SO_2), and lead (Pb). The standards are presented in terms of concentration (e.g., parts per million [ppm]) averaged over various periods of time. Short-term (one-hour, eight-hour, or 24-hour) standards were established for pollutants with acute health effects, while long-term (annual) standards were established for pollutants with chronic health effects.

Under the CAA, state and local agencies may establish air quality standards and regulations of their own, provided these are at least as stringent as Federal requirements. Implementation of the proposed action would affect airspace over New Mexico, Texas, and a small portion of eastern Arizona. The State of New Mexico revised its own ambient air quality standards (AAQS) effective 30 December 1995. According to the preamble of the new regulation, the New Mexico AAQS are not intended to provide a sharp dividing line between air of satisfactory and unsatisfactory quality. They are, however, numbers which represent objectives that will preserve the State's air resources (State of New Mexico, 1994). Texas and Arizona have adopted the NAAQS as their state standard. Table 3.4-1 shows the national and state AAQS relevant to the proposed action.

Individual states are required to establish a State Implementation Plan (SIP) designed to eliminate or reduce the severity and number of NAAQS violations, with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS. The CAA Amendments of 1990 established a practicable framework to achieve attainment and maintenance of health-protective NAAQS. Title I sets provisions for the attainment and maintenance of the NAAQS. Under the General Conformity Rule of the CAA, Section 176(c), activities must not: (a) cause or contribute to any new violation, (b) increase the frequency or severity of any existing violation, or (c) delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of NAAQS.

Current Attainment Status. A review of the Federally published attainment status for Arizona, New Mexico, and Texas, in 40 CFR 81.303, 81.322, and 81.344 (USEPA, 1996a; 1996b), respectively, indicated that all of the counties in the potentially affected area are designated as in attainment, better than the national standards, or unclassifiable for O_3, total suspended particulates (TSP), SO_2, CO, NO_2, and Pb, with the following exceptions:

- Portions of Doña Ana County, New Mexico are classified as marginal nonattainment for O_3 and moderate nonattainment for PM_{10}. The nonattainment areas are restricted to the southern border region of the county (i.e., south of the airspaces potentially affected by the proposed action). Therefore, the proposed action would not encompass the nonattainment segment of the county.

- A small portion of Grant County, New Mexico is classified as nonattainment for SO_2. This area, with a maximum radius of eight miles, is located between Hurley and Bayard, New Mexico, 10 to 20 miles southwest of VR-176 airspace. The airspaces potentially affected by the proposed action do not encompass the nonattainment segment of the county. Wind speeds are typically low, averaging five miles per hour, yet can be strong and gusty in the vicinity of a thunderstorm.

Table 3.4-1. National and State Ambient Air Quality Standards

Air Pollutant	Averaging Time	Federal NAAQS		New Mexico AAQS		Texas/Arizona AAQS	
		Primary	Secondary	Primary	Secondary	Primary	Secondary
Carbon Monoxide (CO)	8-hour	9 ppm	--	8.7 ppm	--	9 ppm	--
	1-hour	35 ppm	--	13.1 ppm	--	35 ppm	--
Nitrogen Dioxide (NO_2)	AAM	0.053 ppm	0.053 ppm	0.05 ppm	0.053 ppm	0.053 ppm	0.053 ppm
	24-hour	--	--	0.10 ppm	--	--	--
Sulfur Dioxide (SO_2)	AAM	0.03 ppm	--	0.02 ppm	--	0.03 ppm	--
	24-hour	0.14 ppm	--	0.10 ppm	--	0.14 ppm	--
	3-hour	--	0.5 ppm	--	0.5 ppm	--	0.5 ppm
Particulate Matter (PM_{10})	AAM	50 $\mu g/m^3$	50 $\mu g/m^3$	--	50 $\mu g/m^3$	50 $\mu g/m^3$	50 $\mu g/m^3$
	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	--	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
Total Suspended Particulates (TSP)	AGM	--	--	60 $\mu g/m^3$	--	--	--
	30-day	--	--	90 $\mu g/m^3$	--	--	--
	7-day	--	--	110 $\mu g/m^3$	--	--	--
	24-hour	--	--	150 $\mu g/m^3$	--	--	--
Ozone (O_3)	1-hour	0.12 ppm	0.12 ppm	0.12 ppm	0.12 ppm	0.12 ppm	0.12 ppm
Lead (Pb)	Calendar Quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

Notes: AAM=Annual Arithmetic Mean; AGM=Annual Geometric Mean; ppm=parts per million; $\mu g/m^3$=micrograms per cubic meter.

The prevailing wind direction is from the west, although southerly winds are common during the warmer months. There should not be any significant transport of emissions to nonattainment areas.

Mandatory Prevention of Significant Deterioration (PSD) Class I areas established under the CAA Amendments of 1977 for the states of Arizona, New Mexico, and Texas are listed under 40 CFR 81.403, 81.421, and 81.429, respectively. These are areas where visibility has been determined to be an important issue by the Administrator, in consultation with the Secretary of the Interior. The nearest PSD Class I area to the region potentially affected by the proposed action is Guadalupe Mountains National Park. Other nearby PSD Class I areas include Big Bend National Park, Carlsbad Caverns National Park, Bosque del Apache NWR, and Gila, Salt Creek, and White Mountain Wilderness Areas.

The New Mexico Air Quality Bureau (AQB) does not monitor ambient pollutant concentrations at Holloman AFB. The nearest routine air quality monitoring occurs in Las Cruces, which is 53 miles to the southwest, and Artesia, located 100 miles to the east. Monitoring data for 1991 through 1993 from these areas are presented in Table 3.4-2 and indicate generally good air quality.

Air Basins. The airspace potentially affected by the proposed action covers portions of south-central New Mexico, western Texas, and a small portion of eastern Arizona. Federal regulations at 40 CFR 81 have defined certain air quality control regions (AQCRs) which were originally designated based on population and topographic criteria closely approximating each air basin. Figure 3.4-1 presents the affected AQCRs in the region. The potential effects on air quality would typically be confined to the air basin in which the emissions occur. Therefore, aircraft emissions were evaluated and summed by AQCR, rather than by the type of airspace, in order to provide a realistic estimate of the impacts on a particular air basin or airshed. The majority of sorties associated with MOAs, Restricted Areas, and MTRs would impact the following four AQCRs:

- AQCR 153, which includes Doña Ana, Lincoln, Otero, and Sierra counties in New Mexico and Brewster, Culberson, Hudspeth, Jeff Davis, and Presidio counties in Texas.
- AQCR 154, which includes Guadalupe and Torrance counties in New Mexico.
- AQCR 155, which includes Chaves, Curry, De Baca, Eddy, Quay, and Roosevelt counties in New Mexico.
- AQCR 156, which includes Catron and Socorro counties, New Mexico.

VR-176 crosses a very small portion of AQCR 014 (Apache County, Arizona and Cibola County, New Mexico) and AQCR 012 (Grant and Luna Counties, New Mexico; and Greenlee County, Arizona). IR-102/141 occupies a small portion of

Table 3.4-2. Air Quality Monitoring Data For Las Cruces and Artesia, New Mexico

Pollutant/Monitoring Station*	Averaging Time	Maximum Concentration by Year		
		1991	1992	1993
Carbon Monoxide (ppm)				
Las Cruces Armory	8-hour	3.5	4.5	3.8
Holiday Inn	8-hour	7	5.7	8.9
Las Cruces Armory	1-hour	6.7	6.6	6.4
Holiday Inn	1-hour	11.9	9.5	8.9
Nitrogen Dioxide (ppm)				
Artesia	Annual	0.006	0.006	0.007
Artesia	24-hour	0.012	0.014	0.016
Ozone (ppm)				
Holiday Inn	1-hour	0.077	0.081	0.084
PM_{10} ($\mu g/m^3$)				
NM Environmental Dept.	Annual	23	23	21
NM Environmental Dept.	24-hour	52	53	56
Sulfur Dioxide (ppm)				
St. Luke's Church	Annual	0.003	0.003	0.002
St. Luke's Church	24-hour	0.02	0.02	0.02
St. Luke's Church	3-hour	0.12	0.09	0.08

Notes: ppm=parts per million by volume;
($\mu g/m^3$ = micrograms per cubic meter

* The Las Cruces Armory, Holiday Inn and NM Environmental Dept. sites are located in Las Cruces. The Artesia data are from two sites: West Logan Avenue in 1991, and North 13th Street in 1992 and 1993. St. Luke's Church is located two miles south of La Union, New Mexico.

Source: State of New Mexico - Air Quality Bureau, 1994.

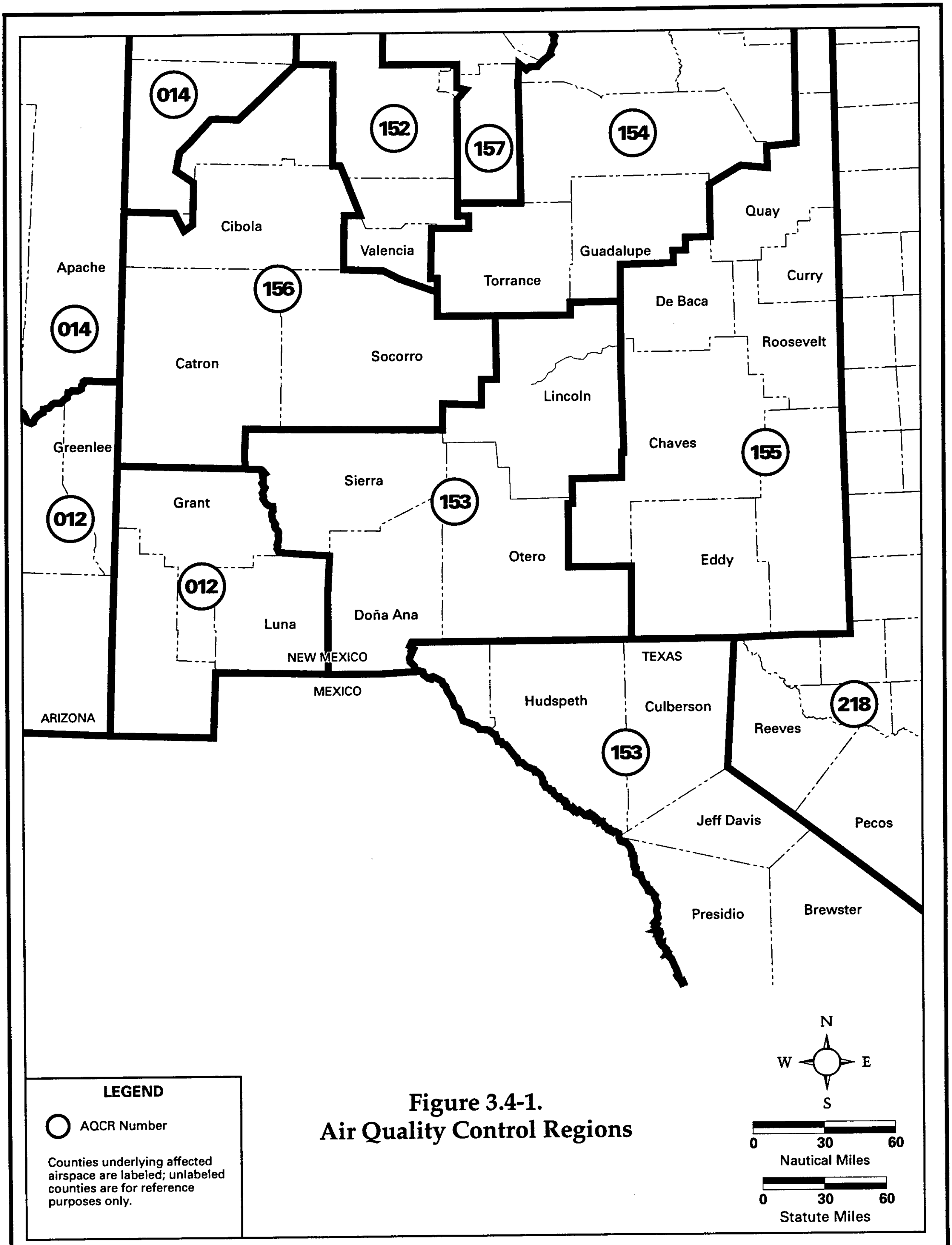

Figure 3.4-1.
Air Quality Control Regions

AQCR 218 (Reeves and Pecos counties, Texas). For individual airspaces which cross two or more AQCRs, the proportion of the airspace in each AQCR was estimated based on the maps presented in Chapter 2.0. Emission totals for each AQCR were calculated by estimating the percentage of each airspace (MOA, Restricted Area, and MTR) in each affected AQCR. The impact on each air basin was then estimated based on total emissions within the corresponding AQCR.

3.4.1 FY95 Conditions

3.4.1.1 Holloman AFB

FY95 emissions from Holloman AFB include traditional stationary sources associated with aircraft and facility maintenance, and mobile sources such as personal vehicles and facility-based utility and construction vehicles, as well as aircraft ground and flying operations within the Holloman aerodrome. In the following tables, volatile organic compounds (VOCs) are precursors to the formation of O_3 in the atmosphere; nitrogen oxides (NO_x) include NO_2 and other compounds; sulfur oxides (SO_x) include SO_2 and other compounds; and PM is equivalent to TSP and includes PM_{10} as a component.

Commuting to and from Holloman AFB. Air pollutant emissions from operations at Holloman AFB include those associated with vehicular travel by employees and tenants to the site. For this assessment, it was assumed that a total of 2,551 military personnel lived on-base during FY95; the remainder of the manpower (3,349 military and civilian personnel) resided off-base and commuted to work in personal vehicles, with an average of 1.2 commuters per vehicle. Vehicle commutes for off-base residents were assumed to be an average of 25 miles per round trip, five days per week, 52 weeks per year (for a total of 2,791 daily trips, or 18,140,000 miles annually). Commuting mileage for on-base residents was assumed to be negligible. Emissions associated with vehicle travel were quantified using emission factors from *Calculation Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien, 1994). All vehicles were assumed to be light-duty, gasoline-powered vehicles of an average model year (1990). Annual criteria pollutant emissions (in tons per year) from personal vehicles commuting for FY95 conditions were 676.9 (CO), 81.6 (VOC), 43.2 (NO_x), and 1.6 (PM).

On-Base Vehicles. Operation of fleet vehicles at Holloman AFB also results in fuel combustion emissions, depending upon the type of vehicle and the annual usage. Vehicle usage data obtained from the base fleet manager (Foster, 1997) were used with emission factors from *Calculation Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien, 1994) and the South Coast Air Quality Management District's *CEQA Air Quality Handbook* (SCAQMD, 1993), which had obtained data from EPA's AP-42. Total FY95 emissions from general and special purpose vehicles from Holloman AFB (in tons per year) were 178.4 (CO), 21.7 (VOC), 216.0 (NO_x), and 20.9 (PM).

Stationary Sources. A 1995 air emissions inventory was developed for stationary source emissions at Holloman AFB (Holloman AFB, 1996). Emissions of criteria

pollutants were organized into the following emission source categories: abrasive blasting, concrete batch plant, degreasers, equipment leaks, EOD, external combustion, fuel dispensing and loading racks, internal combustion, jet engine testing, chemical usage, rock/concrete crusher, storage tanks, surface coating, and woodworking. The facility also houses a number of aircraft ground equipment (AGE). However, AGE is considered an insignificant activity for operating permit requirements by the New Mexico Environment Department. The actual and potential criteria pollutant emissions for Holloman AFB during 1995 are shown, by source category, in Tables 3.4-3 and 3.4-4, respectively. Actual and potential emissions for hazardous air pollutants (HAPs) were presented in the 1995 emissions inventory as facility-wide totals for each HAP. The total actual and potential HAP emissions for Holloman AFB for 1995 are presented in Table 3.4-5.

Aircraft Operations at Holloman AFB. FY95 aircraft emissions for the LTO and TGO cycles in the Holloman aerodrome were calculated using emission factors, flight profiles, and power settings obtained primarily from *Calculation Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien, 1994) and *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources* (USEPA, 1992). The emission factor for SO_x was based upon the national average sulfur content of 0.027 percent in aviation fuels (USEPA, 1992). Table 3.4-6 shows a summary of the annual aircraft emissions from aerodrome operations, including LTOs and multiple patterns (TGOs and low approaches) at Holloman AFB.

Emissions Summary for Holloman AFB. Total FY95 annual emissions from Holloman AFB, for the foregoing sources (stationary sources, aircraft operations, personnel commuting to the base, and on-base fleet vehicles) are summarized in Table 3.4-7.

3.4.1.2 Off-Base Aircraft Operations

Flying operations outside the Holloman aerodrome during FY95 included MOAs, Restricted Areas, and MTRs. Sortie emissions from these operations were calculated using emission factors obtained primarily from *Calculation Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien, 1994) and *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources* (USEPA, 1992), assuming that aircraft are flying at military power for the entire duration of the sortie as shown previously in Table 2.1-8. Annual aircraft emissions in MOAs, Restricted Areas, and MTRs are shown in Tables 3.4-8, 3.4-9, and 3.4-10, respectively.

Summary of Aircraft Emissions. The airspaces potentially affected by the proposed action span a large area over 27 counties in three states. However, the potential effects on air quality would typically be confined to the air basin in which the emissions occur. Emissions were apportioned by AQCR using the methods described in Section 3.4. A summary of FY95 aircraft emissions, by AQCR, is presented in Table 3.4-11.

Table 3.4-3. Actual Criteria Pollutant Emissions at Holloman AFB (CY95)

Source	Actual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
Abrasive blasting					5.0
Concrete batch plant					4.6
Degreasers		14.0			
Equipment leaks		1.7			
Explosive ordnance disposal					25.9
External combustion	0.5	0.1	2.4		0.3
Fuel dispensing		8.2			
Fuel loading racks		0.2			
Internal combustion	0.9	0.3	3.9	0.3	0.2
Jet engine testing	27.1	1.7	3.4	2.7	0.2
Miscellaneous chemical use		23.0			
Rock/concrete crusher					3.0
Storage tanks		19.8			
Surface coating		9.9			1.9
Woodworking					7.6
Total	**28.4**	**79.0**	**9.7**	**3.0**	**48.7**

Source: Holloman AFB, 1996.

Table 3.4-4. Potential Criteria Pollutant Emissions at Holloman AFB (CY95)

Source	Potential Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
Abrasive blasting					250.3
Concrete batch plant					105.1
Degreasers		90.1			
Equipment leaks		1.7			
Explosive ordnance disposal					25.9
External combustion	2.9	0.7	13.9	0.1	1.7
Fuel dispensing		12.0			
Fuel loading racks		1.2			
Internal combustion	11.4	4.0	51.7	3.7	3.4
Jet engine testing	393.7	60.2	121.5	122.0	6.7
Miscellaneous chemical use		93.2			
Rock/concrete crusher					72.3
Storage tanks		23.3			
Surface coating		290.2			56.7
Woodworking					43.9
Total	**408.0**	**576.7**	**187.2**	**125.8**	**565.9**

Table 3.4-5. Actual and Potential Hazardous Air Pollutant Emissions at Holloman AFB (CY95)

Pollutant Name	Actual Emissions (lb/year)	Potential Emissions (lb/year)
Acetaldehyde	169.8	5841
Acetophenone	0.071	0.071
Acrolein	83.08	2871
Antimony	0.247	0.247
Arsenic	2.058	71.4
Benzene	558.6	3122
Beryllium	0.022	0.287
Biphenyl	18.67	18.67
Bis(2-ethylhexyl)phthalate	15.23	181.6
1,3-Butadiene	65.63	2277
Cadmium	27.4	34.17
Carbon tetrachloride	0.03	0.03
Chlorobenzene	0.111	0.744
Chromium	261.2	347.9
Cyanide	0.276	18.54
Cumene	1.202	7.794
Dibenzofuran	0.0062	0.0062
Dibutylphthalate	0	7.914
1,4-Dichlorobenzene	0.0015	0.0015
2,4-Dinitrobenzene	0.0049	0.0049
Ethylbenzene	178.3	1125
Ethylene glycol	15.03	2250
Formaldehyde	539.4	18674
Hexamethylene-1,6-diisocyan	5.255	461.8
Hexane	893.8	1147
Hydrochloric acid	2.594	33.3
Hydrogen cyanide	246.5	246.5
Manganese	0.042	0.556
Mercury	0.566	3.326
Methanol	302.7	37.58
Methyl chloroform	1	1722
Methyl ethyl ketone	10243	118821
Methyl isobutyl ketone	339.6	2586
Methylene chloride	32.38	2953
Naphthalene	168.3	1952
Nickel	0.427	7.587
4-Nitrophenol	0.012	0.012
Phenol	9.099	313.1
Propionaldehyde	33.9	1180
Selenium	0.212	7.093
Styrene	14.8	497.7
Tetrachloroethylene	0	1101
Toluene	1588	27763
Triethylamine	0	1.636
2,2,4-Trimethylpentane	254.1	304.9
Vinyl chloride	0.006	0.006
Xylenes (mixed isomers)	851	9576
m-Xylene	3.198	9.28
o-Xylene	76.42	452.1
p-Xylene	47.65	69.75
TOTAL HAPs	**17051**	**208097**

Table 3.4-6. FY95 Emissions in the Holloman Aerodrome

Operation	Annual Events	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
LTOs	17,104	795.0	245.4	115.2	6.6	84.6
Multiple Pattern*	33,217	90.6	15.3	200.4	7.4	26.6
Total	**50,321**	**885.60**	**260.7**	**315.7**	**13.9**	**111.2**

LTO = Landing and takeoff

* Multiple Patterns: These operations include low approaches for F-117 aircraft and touch-and-go's for all other aircraft.

Table 3.4-7. Summary of Criteria Pollutant Emissions at Holloman AFB

Source	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
Commuting	676.9	81.6	43.2	0.0	1.6
On-Base Vehicles	178.4	21.7	216.0	0.0	20.9
Stationary Sources	28.4	79.0	9.7	3.0	48.7
Aerodrome	885.6	260.7	315.7	13.9	111.2
Total	**1,769.3**	**443.0**	**584.6**	**16.9**	**182.4**

Table 3.4-8. FY95 Emissions from MOA Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Beak A	793	20.5	2.2	14.5	1.0	1.4
Beak B	780	20.4	2.2	14.0	1.0	1.4
Beak C	730	19.9	1.9	12.3	0.9	1.2
Talon	1,848	42.9	6.8	35.2	2.6	3.9
Pecos High	2,914	10.2	1.3	221.9	4.7	2.9
Pecos Low	1,842	8.7	1.0	130.5	3.0	2.2

Table 3.4-9. FY95 Emissions from Restricted Area Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Lava East/West	6,477	36.3	12.6	582.1	13.2	62.7
Mesa High	6,555	38.4	13.0	583.9	13.4	63.0
Mesa Low	1,541	11.4	6.2	58.3	2.6	4.4
Yonder	482	9.3	2.0	11.0	0.8	1.2
R-5103 McGregor High	476	11.7	1.7	8.2	0.7	0.9
Red Rio	6,332	13.3	2.1	135.5	3.2	11.8
Oscura	1,558	22.0	1.4	49.7	1.6	1.5
R-5103 McGregor Low	1,151	33.9	2.8	13.4	1.3	1.3
Melrose R-5104A/B, R-5105	6,214	19.0	2.8	500.9	10.4	7.1

Table 3.4-10. FY95 Emissions from MTR Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
VR-100/125	694	3.0	0.4	114.9	2.2	1.1
VR-176 Long	142	0.6	0.1	16.6	0.4	0.2
VR-176 Short	1,274	5.4	0.8	149.0	3.2	1.7
IR-133	264	6.6	1.3	11.4	0.6	0.8
IR-134/195	145	6.1	0.3	1.4	0.2	0.1
IR-113	1,210	5.1	0.7	204.5	3.9	1.8

Table 3.4-11. FY95 Aircraft Emissions Summary by AQCR

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	5.6	0.9	99.3	2.1	1.3
155	75.0	10.8	1,013.2	22.7	16.2
153	1,060.3	283.1	850.3	30.6	148.2
012	0.3	0.1	8.8	0.2	0.1
156	88.9	29.6	1,213.1	28.9	117.9
218	0.0	0.0	0.0	0.0	0.0

* AQCR 014 emissions excluded due to insignificant levels.

3.4.2 Projected Baseline FY00 Conditions

Programmed changes in personnel at Holloman AFB, and in aircraft use of affected airspace, would result in various changes in air emissions within the affected area. These changes will affect various baseline emission levels presented in the preceding section. Short-term, temporary effects, such as those resulting from construction activities, are not included in these future projections, since any effect would have dissipated by the time the proposed action would be implemented.

3.4.2.1 Holloman AFB

Emissions from Holloman AFB include traditional stationary sources associated with aircraft and facility maintenance, and mobile sources such as personal vehicles and facility-based utility and construction vehicles, as well as aircraft ground and flying operations within the Holloman aerodrome.

Commuting to and from Holloman AFB. Projected FY00 emissions due to vehicle travel, by employees and tenants who live off-base, to the site were calculated using the assumptions and methods used in Section 3.4.1.1, except that the average model year of personal vehicles during FY00 is assumed to be 1995 rather than 1990. A projected total of 2,551 military personnel would live on-base during FY00. The remainder of the manpower (3,089 military and civilian personnel) would live off-base and commute to work in personal vehicles. This would result in an estimated total of 2,574 daily trips and 16,732,000 commuting miles annually. Annual criteria pollutant emissions from commuting personal vehicles for the FY00 baseline (in tons per year) would be 379.9 (CO), 52.0 (VOC), 30.8 (NO_x), and 1.4 (PM).

On-Base Vehicles. Baseline emissions from fleet vehicles would be similar to those presented for FY95.

Stationary Sources. Baseline emissions from stationary air pollution sources during FY00 would be similar to those estimated for FY95, with a slight decrease in aircraft maintenance activities due to the discontinuation of the AT-38 training activities, which is offset by the addition of Tornado aircraft. Consequently, the FY95 emissions inventory data presented in Tables 3.4-3, 3.4-4, and 3.4-5 are assumed to be a conservative estimate for the FY00 emissions inventory.

Aircraft Operations at Holloman AFB. Projected baseline (FY00) aircraft emissions were calculated using emission factors, flight profiles, power settings, and calculation methods used in Section 3.4.1.1. Table 3.4-12 shows the projected FY00 annual baseline aircraft emissions from aerodrome operations, including LTOs and multiple patterns at Holloman AFB.

Emissions Summary for Holloman AFB. Total FY00 annual emissions from Holloman AFB, including stationary sources, aircraft operations, personnel commuting to the base, and on-base fleet vehicles (in tons per year) are estimated to be 1,292.5 (CO), 390.1 (VOC), 620.8 (NO_x), 17.1 (SO_x), and 184.4 (PM).

Table 3.4-12. Projected FY00 Emissions in the Holloman Aerodrome

Operation	Annual Events	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
LTOs	14,804	661.1	225.3	133.2	6.5	85.4
Multiple Patterns*	28,057	44.7	12.1	231.1	7.6	28.0
Total	**42,861**	**705.8**	**237.4**	**364.3**	**14.1**	**113.4**

LTO= Landing and takeoff

* Multiple Patterns: These operations include low approaches for F-117 aircraft and touch-and-go's for all other aircraft.

3.4.2.2 Off-Base Aircraft Operations

Flying operations outside the Holloman aerodrome include MOAs, Restricted Areas, and MTRs. Sortie emissions were calculated using emission factors, sortie durations, power settings, and calculation methods described in Section 3.4.1.1. Annual aircraft emissions in MOAs, Restricted Areas, and MTRs for FY00 baseline are shown in Tables 3.4-13, 3.4-14, and 3.4-15, respectively.

Summary of Aircraft Emissions. The airspaces potentially affected by the proposed action span a large area over 27 counties in three states. However, the potential effects on air quality would typically be confined to the air basin in which the emissions occur. Emissions were apportioned by AQCR using the methods described in Section 3.4.1.2. A summary of projected baseline aircraft emissions during FY00, by AQCR, is presented in Table 3.4-16.

If proposed airspace modifications (U.S. Air Force, 1997a) are not implemented, total emissions would be similar to those presented above because, although the sorties may be redistributed, there would not be any significant change in the total number of sorties. As shown in Table 3.4-17, the overall impacts to various airsheds would be relatively similar.

3.5 BIOLOGICAL RESOURCES

The project's ROI would encompass a broad area over New Mexico, eastern Arizona, and western Texas. The general biota of this area is characterized in Sections 3.5.1 and 3.5.2, while site-specific details of potential interest for the proposed action are presented in Section 3.5.3. The following description applies to both FY95 and FY00 conditions.

3.5.1 Regional Vegetation

Figure 3.5-1 shows overall vegetation patterns in the area potentially affected by the proposed action. Vegetation in the general project area of southern New Mexico, western Texas, and eastern Arizona includes Grassland, Desertscrub, Scrub, and Forest formations (Brown et al., 1979; Brown, 1982). These formations are similar to the Grassland, Scrubland, Woodland, and Forest vegetation types described by Dick-Peddie (1993) and the Great Plains-Shortgrass Prairie Province, Chihuahuan Desert Province, Colorado Plateau Province, and Upper Gila Mountains Forest Province described by Bailey (1980). The vegetation formations found in the ROI are further classified as discussed below. This discussion is a summary of information from Brown (1982), Dick-Peddie (1993), and Bailey (1980). Nomenclature for vegetation types follows Brown (1982).

Grassland Formation — Plains and Great Basin Grassland. Plains and Great Basin Grasslands are found above 4,000 feet (below Pinyon-Juniper vegetation and above Semidesert Grasslands) on generally level plains, mesas, and low hills. In the ROI, Plains Grasslands are primarily found in eastern New Mexico. Historically, the vegetation was grass-dominated with some shrub encroachment from drainages.

Table 3.4-13. Projected FY00 Emissions from MOA Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Beak A	549	10.4	2.0	15.1	0.8	1.5
Beak B	547	10.4	1.9	15.2	0.8	1.5
Beak C	485	9.7	1.6	12.8	0.7	1.2
Talon	1,632	26.7	6.4	48.5	2.7	4.7
Pecos High	2,884	8.9	1.0	136.5	3.1	2.6
Pecos Low	4,148	11.7	1.3	195.4	4.4	3.4

Table 3.4-14. Projected FY00 Emissions from Restricted Area Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Lava East/West	6,501	35.2	12.6	585.7	13.3	62.9
Mesa High	6,515	36.0	13.0	585.4	13.4	63.1
Mesa Low	1,603	12.1	6.2	61.5	2.7	4.6
Yonder	387	5.7	2.0	10.7	0.7	1.2
R-5103 McGregor High	331	6.1	1.5	7.7	0.5	0.9
Red Rio	6,576	9.5	2.0	144.3	3.3	12.3
Oscura	1,667	6.6	1.0	61.4	1.6	2.2
R-5103 McGregor Low	833	6.3	2.1	22.8	1.1	1.9
Melrose R-5104A/B, R-5105	8,744	26.4	3.2	594.2	12.6	10.0

Table 3.4-15. Projected FY00 Emissions from MTR Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NOx	SOx	PM
VR-100/125	1,220	4.3	0.4	111.0	2.3	1.6
VR-176 Short	1,036	5.1	0.8	71.9	1.8	1.5
VR-176 Long	109	0.5	0.1	7.7	0.2	0.2
IR-133	1,164	13.5	0.8	58.3	1.8	3.1
IR-134/195	247	2.9	0.3	11.9	0.4	0.7
IR-192/194	171	2.0	0.2	8.4	0.3	0.5
IR-113	580	1.8	0.2	53.6	1.1	0.7
IR-102 Short	150	2.4	0.2	8.7	0.3	0.5
IR-102 Long	38	0.6	0.0	2.3	0.1	0.1
IR-141 Short	367	5.8	0.6	21.5	0.8	1.4
IR-141 Long	84	1.3	0.1	5.0	0.2	0.3

Table 3.4-16. Projected Aircraft Emissions Summary by AQCR

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	8.4	0.7	86.9	2.1	2.3
155	69.9	10.7	1,005.4	23.1	20.3
153	805.0	258.1	931.8	31.3	156.3
012	0.3	0.0	4.1	0.1	0.1
156	83.5	29.3	1,191.9	28.7	119.0
218	0.4	0.0	1.5	0.1	0.1

* AQCR 014 emissions excluded due to insignificant levels.

Table 3.4-17. Projected FY00 Aircraft Emissions Summary by AQCR (If ALCM/Talon is not Implemented)

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	8.9	0.6	89.2	2.2	2.4
155	68.0	10.8	997.0	22.9	19.9
153	798.7	257.9	909.2	30.4	155.0
012	0.5	0.0	5.2	0.1	0.1
156	87.4	29.3	1209.3	29.1	119.9
218	0.0	0.0	0.0	0.0	0.0

* AQCR 014 emissions excluded due to insignificant levels.

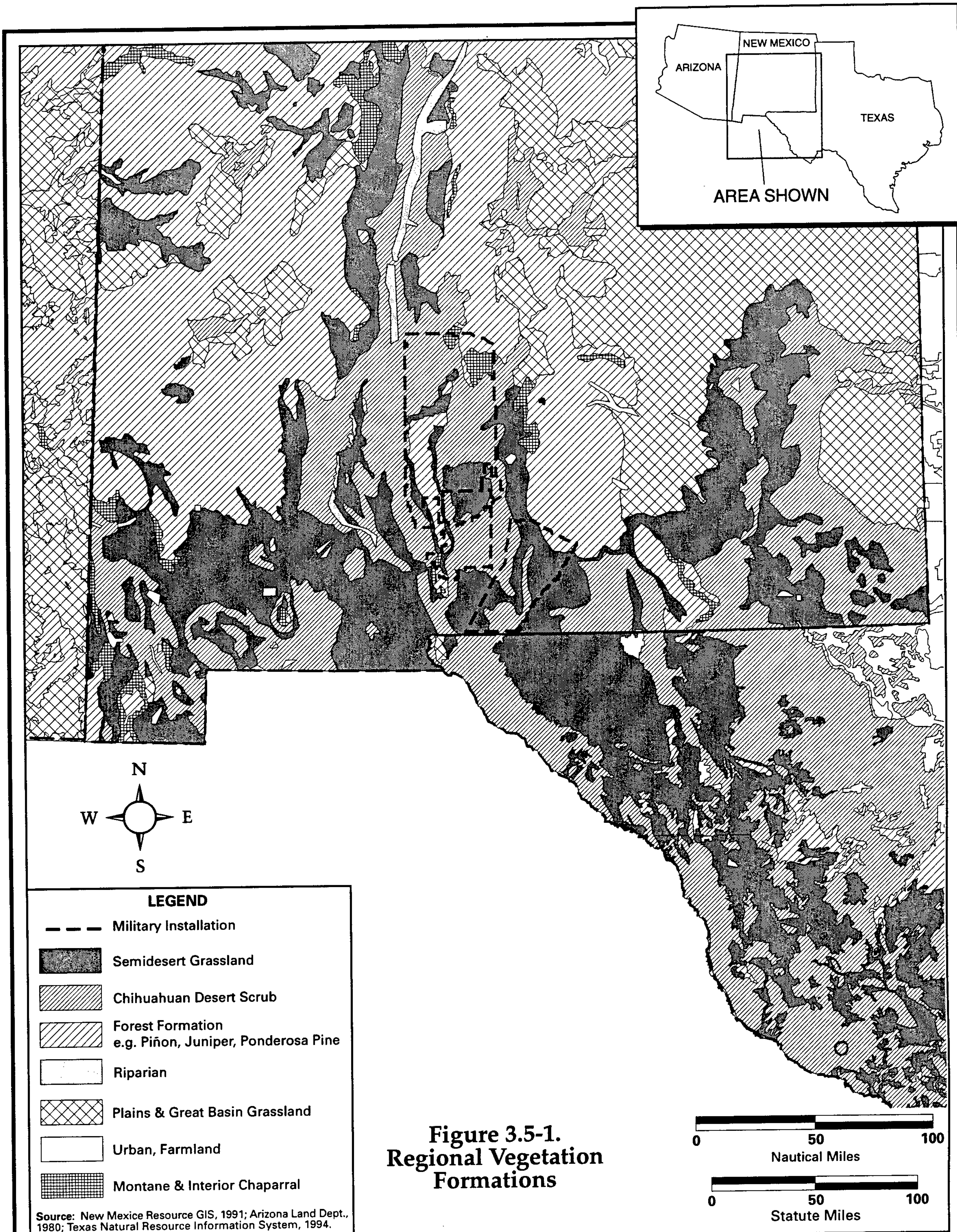

**Figure 3.5-1.
Regional Vegetation
Formations**

Because of fire suppression and grazing practices, shrubs are more prevalent in current vegetation and may dominate in some locations. Principal grass species in the Plains Grasslands include blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), Indian ricegrass (*Oryzopsis hymenoides*), dropseed (*Sporobolus* spp.), galleta grass (*Hilaria jamesii*), and lovegrass (*Eragrostis* spp.). Common shrub species include saltbush (*Atriplex* spp.), winterfat (*Ceratoides lanata*), rabbitbrush (*Chrysothamnus* spp.), and snakeweed (*Xanthocephalum sarothrae*). Common forbs include coneflowers (*Ratibida* spp.) and globemallows (*Sphaeralcea* spp.).

Grassland Formation — Semidesert Grassland. Semidesert Grasslands are found between Chihuahuan Desertscrub vegetation and Plains Grasslands, between 3,600 and 5,600 feet elevation. It is the most common grassland vegetation in the lower elevations of the ROI and is dominant in the southern portions of the ROI in New Mexico. This vegetation type shares characteristics of both the Plains Grasslands and Chihuahuan Desertscrub. Therefore, the vegetation has a large grass component similar to the Plains Grasslands and also has a diverse shrub structure similar to the Chihuahuan Desertscrub. Black grama (*Bouteloua eriopoda*) is the dominant grass species, especially on gravelly upland sites. Tobosa grass (*Hilaria mutica*) is the dominant grass species on heavier (clay) soils in lowlands and swales. Other grasses include other grama grasses, muhly (*Muhlenbergia* spp.), threeawn (*Aristida* spp.), tridens (*Tridens* spp.), fluffgrass (*Erioneuron pulchellum*) and buffalograss. Common succulents include agaves (*Agave* spp.), sotol (*Dasylirion* spp.), yucca (*Yucca* spp.), and pricklypear (*Opuntia* spp.).

Common shrubs include mesquite (*Prosopis* spp.), feather peabush (*Dalea formosa*), mariola (*Parthenium incanum*), allthorn (*Koeberlinia spinosa*), acacias (*Acacia* spp.), ocotillo (*Fouquieria splendens*), tarbush (*Flourensia cernua*), creosotebush (*Larrea tridentata*), and snakeweed.

Desertscrub Formation — Chihuahuan Desertscrub. Chihuahuan Desertscrub is found in southern New Mexico and western Texas within the affected area. This vegetation type is adjacent to Semidesert Grasslands and has been expanding and replacing grasslands (Brown, 1982). This vegetation is primarily found on gravelly and limestone soils and typically occurs between 1,300 and 5,250 feet in elevation. Vegetation is shrub-dominated with creosotebush, tarbush, and whitethorn (*Acacia neovernicosa*) being three of the most consistent and dominant species present. In addition, mesquite (*Prosopis glandulosa*) is a dominant species on sandy soils. Besides these four species, over 1,000 species have been identified in the Chihuahuan Desertscrub; therefore, vegetation can be different between specific sites (Brown, 1982). Other shrubs commonly found include acacias, ephedra (*Ephedra* spp.), ocotillo, saltbush, graythorn (*Ziziphus obtusifolia*), and condalia (*Condalia* spp.). Agaves, yucca, and other succulents are common. Common grasses include dropseeds, grama grasses, tobosa grass, and Indian ricegrass.

Scrub Formation — Interior Chaparral. Interior Chaparral is found in the midwestern portion of the affected area in eastern Arizona and western New Mexico at elevations between 3,400 and 6,500 feet. This vegetation type is also found on isolated mountains in New Mexico (e.g., Burro, Florida, Organ, and Guadalupe

Mountains) and Texas (e.g., Glass Mountains). Interior Chaparral typically borders ponderosa pine (*Pinus ponderosa*) and pinyon pine-juniper vegetation types.

Common woody plant species include oaks (*Quercus* spp.), manzanita (*Arctostaphylos* spp.), madrone (*Arbutus* spp.), snowberry (*Symphoricarpus* spp.), Apache plume (*Fallugia paradoxa*), mountain mahogany (*Cercocarpus montanus*), chokecherry (*Prunus virginiana*), sumac (*Rhus* spp.), and deerbrush (*Ceanothus* spp.). Grass species vary from northwest to southeast. In more northwestern and higher elevation locations, junegrass (*Koeleria macrantha*), wheatgrass (*Agropyron* spp.), and bluegrass (*Poa* spp.) are common. Grama grass, Indian ricegrass, threeawn, and other warm-season grasses are more common in the lower elevations and in the southern portions of this vegetation type.

Desertscrub Formation — Great Basin Desertscrub. A limited amount of Great Basin Desertscrub vegetation may be found in the extreme northwest to north-central portions of the affected area in New Mexico. This vegetation type is found at elevations similar to Chihuahuan Desertscrub and Interior Chaparral. This shrub-dominated vegetation type is a transition vegetation type between warm desert vegetation types (e.g., Chihuahuan Desertscrub) and cool-temperate vegetation (e.g., Great Basin Shrub). Dominant shrub species include saltbush, shadscale (*Atriplex confertifolia*), big sagebrush (*Artemisia tridentata*), winterfat, rabbitbrush, and greasewood (*Sarcobatus vermiculatus*). Unlike the Chihuahuan Desertscrub, this vegetation type has relatively low plant species diversity, and plant communities are usually dominated by a single shrub species.

Forest Formation — Petran (Rocky Mountain) Montane Conifer Forest. This forest type is found on mesas, plateaus, and isolated mountain ranges, including the southern extension of the Rocky Mountains. Petran Montane Conifer Forest may be found in the affected area in New Mexico and Texas at elevations between 7,220 feet to above 9,850 feet, but is more typically found between 7,550 and 8,700 feet (Brown, 1982). Ponderosa pine is the dominant species, with white pine (*P. strobiformis*), Gambel oak (*Quercus gambelii*), and New Mexican locust (*Robinia neomexicana*) being common. Chihuahua pine (*P. leiophylla*) is common in southwestern New Mexico and southeastern Arizona. Common understory shrubs include mahonia (*Berberis* spp.), sumac, currant (*Ribes* spp.), snowberry (*Symphoricarpos* spp.), and ceanothus. Grasses include fescue (*Festuca* spp.), panicgrasses (*Panicum* spp.), bluegrass, muhly, and junegrass.

In the New Mexico portion of the affected area, this vegetation type is found in the Sacramento and Mogollon mountains. In addition, this vegetation type is found in the Guadalupe and Davis mountains of western Texas. The Sacramentos are dominated by Douglas fir (*Pseudotsuga taxifolia*), white fir (*Abies concolor*), and ponderosa pine, which is the most common mixed conifer forest in New Mexico (Dick-Peddie, 1993).

Forest Formation — Great Basin Conifer Woodland (Pinyon-Juniper Series). The Great Basin Conifer Woodland vegetation type is represented by pinyon-juniper vegetation in the affected area. Pinyon-juniper is found within the affected area at

elevations between 4,920 and 7,550 feet (e.g., Sacramento, Guadalupe, Organ, and Mogollon mountains). This vegetation type is typically found on thin and rocky soils. One-seed juniper (*Juniperus monosperma*) and pinyon pine (*P. edulis*) are the dominant woody species. Woody understory species include snakeweed, groundsel (*Senecio* spp.), saltbush, sagebrush, oaks, currants (*Ribes* spp.), and rabbitbrush. Common herbaceous species include grama grasses, galleta grass, threeawn, little bluestem (*Schizachyidum scoparium*), Indian ricegrass, muhlys, dropseeds, and junegrass. The general trend data were collected from the NMDGF website and from resources managers and experts in the states potentially affected by the proposed action.

3.5.2 Regional Wildlife

Many animal species are associated with specific habitats while others are associated with multiple habitats. Common animal species associated with each of the major vegetation types found within the affected area are discussed below. Table 3.5-1 provides additional general abundance and trend information for selected wildlife within New Mexico, Arizona, and Texas.

Animal species in the grassland vegetation types (i.e., Plains and Great Basin Grassland and Semidesert Grassland) are diverse. These grasslands are important hunting grounds for raptors, from common Swainson's hawk (*Buteo swainsonii*) to the less common ferruginous hawk (*Buteo regalis*), red-tailed hawks (*Buteo jamaicensis*) and prairie falcon (*Falco mexicanus*). The most common large grassland raptor in breeding season is Swainson's hawk. Red-tailed hawks are more common in areas with more topographic relief, such as the edge of mesas, and in the foothills and mountains. Other common bird species include burrowing owl (*Speotyto cunicularia*), grasshopper sparrow (*Ammodramus savannarum*), and lark bunting (*Calamospiza melanocorys*). The Western diamondback rattlesnake (*Crotalus atrox*), Western box turtle (*Terrapene ornata*), earless lizard (*Holbrookia maculata*), fence lizard (*Sceloporus* spp.), spadefoot toad (*Scaphiopus bombifrons*), coachwhip snake (*Masticophis bilineatus)*, and milk snake (*Lampropeltis* spp.) are common reptiles. Pronghorn (*Antilocapra americana*) and javelina (*Dicotyles tajacu*) are regular inhabitants.

Wildlife species likely to occur in Chihuahuan Desertscrub habitat include reptiles such as desert spiny lizard (*Sceloporus magister*) and Texas horned lizard (*Phrynosoma cornutum*); mammals such as spotted ground squirrel (*Citellus spilosoma*), desert cottontail (*Sylvilagus auduboni*), and blacktail jackrabbit (*Lepus californicus*); and birds such as cactus wren (*Campylorhynchus brunneicapillus*), black-throated sparrow (*Amphispiza bilineata*), and curve-bill thrasher (*Toxostoma curvirostre*).

Common mammals of Interior Chaparral vegetation include mule deer (*Odocoileus hemionus*), Eastern cottontail (*Sylvilagus floridanus*), white-footed mouse (*Peromyscus leucopus*), and white-throated woodrat (*Neotoma albigula*). Common birds include scrub jay (*Aphelocoma coerulescens*), canyon wren

Table 3.5-1. Abundance Information For Selected Wildlife Species in New Mexico, Arizona, and Texas

Common Name	Latin Name	General Trend* in New Mexico, Arizona, and Texas	Area-Specific Trends, Comments
Mountain Lion	*Felis concolor*	NM - uncertain statewide AZ - stable to increasing statewide TX - stable statewide	Occurs throughout New Mexico (San Andres NWR, Bosque del Apache NWR, Gila NF, Cibola NF, Coronado NF, WSNM, Bandelier NM); however, its status is not well-known. San Andres population was 47-52 individuals over the period 1985-1995 (Logan et al., 1996; Sweanor and Logan, 1997). The general consensus of biologists in New Mexico is that the mountain lion population is increasing (Heft, 1997). In Arizona, good habitat is found particularly in southern two-thirds of Apache-Sitgreaves NF (Phelps, 1997). Average density is 1 lion per 25 square miles. General Arizona statewide population is at 3,000 and increasing. In west Texas, lions are mainly in major mountain areas. Population is low and relatively stable.
Black Bear	*Ursus americanus*	NM - uncertain statewide AZ - increasing statewide TX - increasing statewide	Black bear habitat is found in the Capitan, Sacramento, and Guadalupe Mountains east of the Rio Grande and in the Mimbres (including the Gila and Aldo Leopold Wilderness Areas), San Mateo, Black, and Magdelena Mts. west of the Rio Grande. The long-term trends in bear pelt numbers over the past 17 years have been increasing, which is consistent with a gradually increasing bear population. However, in direct contrast, reproduction and survival rates of adult females during a four-year field study indicate that the population may be decreasing. Adult female survival estimates were similar to other western state data. Reproductive success was poor compared to data from other western states (Weybright, 1997). In Arizona, excellent habitat supports a stable population in the lower two-thirds of Apache-Sitgreaves NF (Phelps, 1997). Few bears are present in west Texas.
Oryx	*Oryx gazella*	NM - increasing statewide AZ - not present in ROI TX - not present in ROI	Introduced in 1969. Released on WSMR, Florida Mts. near Deming; common at White Sands National Monument, WSMR, and Holloman AFB; occasionally seen at McGregor Range and Bosque del Apache NWR (NMDGF, 1997). Population is increasing and range is expanding (Logan et al., 1996). The oryx has become a problem on Jornado del Muerto Experimental Range. Oryx are not present in the Texas or Arizona portions of the ROI.
Pronghorn	*Antilocapra americana*	NM - uncertain statewide AZ - uncertain statewide TX - declining	In Texas, the pronghorn population has declined from 14,000 to 7,000 animals over the past several years. Drought and lack of food are the primary causes for the decline. On McGregor Range, pronghorn occur mostly in grassland communities of Otero Mesa and below the mesa with occasional use of desert shrubland habitat in the Tularosa Basin. An estimated 500-750 pronghorn inhabit Otero Mesa of Ft. Bliss. Generally not under the airspace in Arizona.

Table 3.5-1. Abundance Information For Selected Wildlife Species in New Mexico, Arizona, and Texas (continued)

Common Name	Latin Name	General Trend* in New Mexico, Arizona, and Texas	Area-Specific Trends, Comments
Desert Bighorn Sheep	*Ovis canadensis mexicana*	NM - generally declining statewide AZ - not present in ROI TX - stable statewide	Desert bighorn sheep historically occurred in 16 areas in NM, now reduced to 5 areas, with less than 130 animals statewide (NMDGF, 1997). San Andres population estimates were 270 in 1967; 200 in 1976; less than 35 in 1984; currently less than 10 animals remain. (Weisenberger, 1997; Rominger, 1997; Heft, 1997). This population will probably be lost in the near future if it is not augmented. The crash is largely due to a scabies mite outbreak. Big Hatchet population estimates include 125-150 in the mid-1950s; 20 in the 1970s; supplemented with 14 sheep in 1978; supplemented with 18 sheep in 1982; supplemented with 6 rams in 1997 (NMDGF, 1998); currently about 60 animals. This herd has declined due to many factors including drought. The Peloncillo population was reintroduced with 30 sheep in 1980 and 24 additional sheep were released in 1997 (hunted herd with 2 permits allocated each year) (NMDGF, 1998). This population remains low; its decline has been associated with habitat loss, livestock competition, predation, disease and human disturbance (NMDGF, 1997). There is a fourth population known from the Sevilleta NWR. This herd is known to occur from Ladron Mts. to "M" mountain. The fall 1996 survey indicated that there were 32 individuals in this herd. An additional 8 rams were released in 1997 (NMDGF, 1997). This population is thought to be relatively stable, with the biggest threat coming from mountain lion predation (Heft, 1997). Less than 10 bighorn were released in the Fra Cristobal Mts. in November 1997. Seven bighorn (*Ovis canadensis nelsoni*) have been introduced into west Texas (Sierra Diablo, Chinati, and Elephant Mountains). Population is small (over 300) and closely managed.
Rocky Mountain Bighorn Sheep	*Ovis canadensis canadensis*	NM - stable statewide AZ - stable statewide TX - not present in ROI	This subspecies, which once thrived in NM, was probably extirpated from NM by 1906. There are currently 6 populations that have been reintroduced: Wheeler Peak, Pecos Wilderness, Sandia Mts., Manzano Mts., Turkey Creek (Gila NF), and San Francisco River (Gila NF, at foot of Mogollon Mts.) (NMDGF, 1997). The Manzano herd consists of 20-30 individuals that move from the Sevilleta to the Manzano Mts. There is a plan to transplant about 70 from the Pecos herd to this herd in August 1997. This herd is declining due to highway and train crossings at Blue Canyon (north side of Highway 60), and poaching (Heft, 1997).
Mule Deer	*Odocoileus hemionus*	NM - declining statewide AZ - declining statewide TX - declining statewide	In NM the population has never been large or uniformly distributed. Deer hunting has been closed on McGregor Range for the last 2 years due to declining population. Low fawn survival rate and low buck recruitment are causes (Madsen, 1997b). It appears that precipitation and temperature patterns dictate the deer population dynamics more than other variables. It has been proposed that extended drought is the primary reason the population has declined in recent years (Madsen, 1997b). Mule deer population has declined 50 percent in Apache-Sitgreaves National Forest, AZ (Phelps, 1997). Decrease similar to other mule deer populations throughout western U.S. About 127,000 mule deer are present throughout west Texas. The population has declined about 15 to 20% over the past 3 to 4 years of drought.

Table 3.5-1. Abundance Information For Selected Wildlife Species in New Mexico, Arizona, and Texas (continued)

Common Name	Latin Name	General Trend* in New Mexico, Arizona, and Texas	Area-Specific Trends, Comments
Elk	*Cervus canadensis*	NM - increasing statewide AZ - increasing statewide TX - not present in the ROI	Elk habitat is associated with mountain ranges including Capitan, Sacramento, and Guadalupe mountains east of the Rio Grande, and the Mimbres (including the Gila and Aldo Leopold Wilderness Areas), San Mateo, Black, and Magdelena mountains west of the Rio Grande. No critical winter habitat is identified because of the mild winters. Elk are increasing in numbers and distribution statewide (Weybright, 1997). Summer habitat is primarily in the upper one-third, year-round habitat is found in the center-third, and winter habitat is in the lower one-third of Apache-Sitgreaves National Forest, AZ (Phelps, 1997). Arizona populations are increasing. Elk are present in Guadalupe Mountains National Park, Texas, but are not found in any of the habitat or under airspace in Texas.
Mexican Free-Tailed Bat	*Tadarida brasiliensis*	NM stable statewide AZ stable statewide TX stable statewide	Broadly distributed throughout New Mexico, Arizona, and Texas. Large colonies found in Carlsbad Caverns National Park and Jornado Caves (under VR-176 in the region of Fra Cristobal Mts). Usually occurs below 6000 feet in pinyon-juniper woodland, desert grassland, or desert communities (although in New Mexico it may occur as high as 8200 feet). Roosts in caves, buildings, under bridges, and other shelters. Species considered by the Natural Heritage Program.
Gambel's Quail, Scaled Quail, Northern Bobwhite, Montezuma Quail	*Callipepla gambelii, C. squamata, Colinus virginianus, Cyrtonyx montezumae*	NM - all 4 species declining statewide AZ - declining statewide TX - declining statewide	All 4 species have been declining throughout the Southwest due primarily to the recent drought. Populations are expected to rebound as the drought cycle ends (Hale, 1997).
Lesser Prairie Chicken	*Tympanuchus pallidicinctus*	NM - declining statewide AZ - not present in ROI TX - not present in ROI	This species is experiencing a decline, particularly in the eastern part of the state, due to both the recent drought and general habitat decline. There is a petition by an interagency working group to list the species under the Endangered Species Act: CO, TX, NM, OK, KS (Hale, 1997).
Blue Grouse	*Dendragapus obscurus*	NM - relatively stable statewide AZ - relatively stable statewide TX- not present in ROI	Not much is known about the species status, as no survey is conducted regarding this species. The population is believed to be relatively stable, given the data available (Hale, 1997).

Table 3.5-1. Abundance Information For Selected Wildlife Species in New Mexico, Arizona, and Texas (continued)

Common Name	Latin Name	General Trend* in New Mexico, Arizona, and Texas	Area-Specific Trends, Comments
Pheasant	*Phasianus colchicus*	NM - relatively stable statewide AZ - not present in ROI TX - not present in ROI	Not much is known regarding this species, as there is no survey conducted for it in New Mexico. It is a non-native, naturalized species that is believed to be relatively stable (Hale, 1997).
Ducks		NM - declining statewide AZ - generally not in ROI TX - stable statewide	In general, ducks throughout the western U.S. are rebounding due to the northern states' recent increase in precipitation. NM has not really experienced these increases at this time (Hale, 1997). In west Texas, ducks are found along portions of the Rio Grande and use stock water tanks. In Apach-Sitgreaves NF, Arizona and in the vicinity of VR-176, ducks use Luna Lake and Alpine lakes and river system.
Snow Goose, Ross' Goose	*Chen caerulescens, C. rossii*	NM - increasing statewide AZ - not present in ROI TX - not present in ROI	These two species are experiencing such increases in population that they are destroying their northern breeding grounds. Prolific breeders and limited harvest pressure are indicated as reasons for increases (Hale, 1997). Habitat not present in Arizona or Texas portions of ROI.
Canada Goose	*Branta canadensis*	NM - declining statewide AZ - not generally present in ROI TX - not generally present in ROI	This species is showing a decline in NM because they are "short-stopping" in Colorado. 5,000-8,000 are known to occur in the Rio Grande Valley -- Santa Fe down to Elephant Butte (Hale, 1997).
Sandhill Crane	*Grus canadensis*	NM- uncertain AZ - not present in ROI TX - not present in ROI	There are 2 populations: the mid-continent populations found along the Pecos River, which includes 500,000 individuals; and the Rocky Mt. population which overwinters at Bosque del Apache NWR (Socorro and Valencia counties, NM). The numbers of the Rocky Mt. population have been down in recent years (NMDGF, 1997; Hale, 1997). It is unknown whether the Rocky Mt. population is currently stable or declining. Current survey methods are suspected to be inadequate in differentiating populations (Hale, 1997).

Table 3.5-1. Abundance Information For Selected Wildlife Species in New Mexico, Arizona, and Texas (continued)

Common Name	Latin Name	General Trend* in New Mexico, Arizona, and Texas	Area-Specific Trends, Comments
Golden Eagle	*Aquila chrysaetos*	NM- stable statewide AZ- uncertain TX- uncertain	Species found throughout the ROI, including west Texas, Apache-Sitgreaves NF, Arizona, and throughout New Mexico. Nests on cliffs over open habitat and winters throughout the ROI. Relatively common during the winter on McGregor Range but no nests are located on the range. During winter surveys on the Tularosa Basin portion of McGregor Range, 34 golden eagles were observed in 1994 and 28 were observed in 1995 (Tafanelli and Meyer, 1995; Tafanelli et al., 1996). On the Otero Mesa portion of McGregor Range, 25 birds were observed in 1994 and 33 were observed in 1995. None were observed during breeding bird surveys in 1996 (Pidgeon and Mathews, 1996). Permanent resident of WSMR with nests in San Andres and Mockingbird Mts. (WSMR, 1995). Observed on Holloman AFB.

*Trends based on communications with New Mexico Department of Game and Fish, Arizona Department of Fish and Game, and Texas Parks and Wildlife Department.

(*Catherpes mexicanus*), Crissal thrasher (*Toxostoma crissale*), towhee (*Pipilo* spp.), black-chinned sparrow, and rufous-crowned sparrow (*Aimophila ruficeps*). Common reptiles include fence lizard, side-blotched lizard (*Uta stansburiana*), coachwhip snake, Western blind snake (*Leptotyphlops humilis*), glossy snake (*Arizona elegans*), and Western rattlesnake (*Crotalus viridis*).

Wildlife common to Great Basin Desertscrub vegetation includes reptiles such as whiptail lizard (*Cnemidophorus* spp.), rattlesnake, collared lizard (*Crotaphytus* spp.), spadefoot toad, fence lizard, and side-blotched lizard. Common bird species include sage sparrow (*Amphispiza belli*), and sage thrasher (*Oreoscoptes montanus*). Mammal species include bighorn sheep, pronghorn, mule deer, pocket gopher (*Thomomys* spp.), blacktail jackrabbit, and kangaroo rat (*Dipodomys* spp.).

Wildlife species common to Petran (Rocky Mountain) Montane Conifer Forest vegetation are diverse. Reptiles include skink (*Eumeces* spp.), fence lizard, rattlesnake, salamanders (*Ambystoma* spp. and *Plethodon* spp.), kingsnake (*Lampropeltis* spp.), and garter snake (*Thamnophis* spp.). Examples of common bird species include raptors, flycatchers, juncos (*Junco* spp.), tanagers (*Piranga* spp.), and vireos (*Vireo* spp.). Mammal species found in this vegetation type include elk, mule deer, deer mice, squirrels (*Sciurus* spp.), and cottontail rabbits.

Wildlife species specifically linked to Great Basin Conifer Woodland (Pinyon-Juniper series) vegetation are limited. However, other species found in other vegetation types (e.g., Great Basin Desertscrub) are also found in this vegetation type. Reptiles representative of Great Basin Conifer Woodland (Pinyon-Juniper series) vegetation include whiptail lizard and fence lizard. Bird species representative to this vegetation include pinyon jay (*Gymnorhinus cyanocephalus*), gray flycatcher (*Empidonax wrightii*), and black-throated gray warbler (*Dendroica nigrescens*). Mammals include woodrat, pinyon deer mouse (*Peromyscus truei*), mule deer, and elk (*Cervus elaphus*).

Wildlife identified by state wildlife management agencies as important management species and that may be affected by implementation of the proposed action include big game and waterfowl.

Mule deer are found throughout the region. Mule deer are more commonly associated with drainages, pinyon-juniper, and shrub habitats, while pronghorn are generally associated with open grasslands and low shrub communities (USDOI, 1994). The Cedar Hills mule deer management area in Lincoln County, New Mexico is near IR-133. In general, the statewide mule deer population has been in decline over the past few years. It has been hypothesized that extended drought is the primary reason for the decline (Madsen, 1997b). Portions of Macho WMA in Lincoln County, New Mexico, which partially underlies IR-133, contain preferred shortgrass habitat for pronghorn. Also, an antelope habitat study area is in the Eagle Creek-Feliz River area of Chaves and Eddy counties, New Mexico (USDOI, 1994).

Desert bighorn sheep have been introduced into west Texas and portions of New Mexico. Introduced populations in Texas are limited to isolated ranges including the

Sierra Diablo Mountains in Hudspeth and Culberson counties, north of Van Horn, Texas, Chinati Mountains located in Presidio County, south of Marfa, Texas, and Elephant Mountain in Brewster County near Alpine, Texas.

Habitat and migration paths for numerous raptor species are present in the area. Migration corridors include the Rio Grande River, Pecos River, and the mountain ranges running north to south to the east of the Rio Grande River. Twenty-seven raptor species have been sighted in the general region (USDOI, 1994). Similarly, shorebirds and waterfowl migrate through the area seasonally. Nearly 200 species of shorebirds and waterfowl generally are associated with drainages and open water, especially Bitter Lake NWR, New Mexico, the BLM Overflow Wetlands Wildlife Habitat Area in New Mexico, and the Pecos and Rio Grande rivers in Texas and New Mexico.

3.5.3 Location-Specific Characterization

Holloman Air Force Base. Vegetation on Holloman AFB is part of the Chihuahuan Desertscrub type with some Semidesert Grassland vegetation present. Following the vegetation classification map for Holloman AFB (U.S. Army, 1997), there are 19 map units representating natural vegetation, 10 shrubland types (56 percent of total area), five grassland types (27 percent), one woodland type (less than one percent), and three miscellaneous types: barren dunelands, rock outcrops and barren alkaline playas (five percent). Developed or ground disturbance areas that are devoid of vegetation make up over 11 percent of the installation. Virtually no vegetation exists on most of the proposed sites for the new base facilities. However, 15 acres of relatively undisturbed four-wing saltbush/alkali sacaton habitat is present at the proposed munitions storage area.

The two most common shrubland communities are the Hoary Rosemarymint Dune Shrubland and Fourwing Saltbush/Gyp Dropseed Shrublands. These communities are dominated by hoary rosemarymint (*Poliomintha incana*) with soaptree yucca (*Yucca elata*), Torrey's jointfir (*Ephedra torreyana*) and sandhill muhly (*Muhlenbergia pungens*). In the latter community, fourwing saltbush (*Atriplex canescens*) clearly dominates the shrub layer with Christmans cactus (*Opuntia leptocaulis*), kingcup cactus (*Echinocerus triglochidiatus*) and Berlandier's wolfberry (*Lycium berlandieri*) as common associates. The understory is dominated by gyp dropseed (*Sporobolus nealleyi*), but alkali sacaton (*S. airoides*) may occasionally co-dominate. The most common grassland communities are Gyp Dropseed Grassland and Alkali Sacaton Grassland. Vegetation communities common within arroyos, drainages, and alluvial flats include Sparse Fourwing Saltbush Shrubland, Semi-Riparian Alkali Sacaton Grassland, and Pickleweed Shrubland. Depending on soil conditions, these areas are dominated by open stands of fourwing saltbush, dense stands of alkali sacaton, and on highly alkaline soils, pickleweed (*Allenrolfea occidentalis*).

Affected Airspace. Vegetation beneath each airspace unit is generally as described under Section 3.5.1, Regional Vegetation. Table 3.5-2 provides general estimates of acreage and vegetation type beneath the affected airspace within the ROI. Special

Table 3.5-2. Estimated Vegetation Type Within Each Airspace Component (in acres)

Airspace	Plains and Great Basin Grassland	Semidesert Grassland	Chihuahuan Desertscrub and Great Basin Desertscrub	Interior Chaparral	Great Basin Conifer Woodland and Petran Montane Conifer Forest	Riparian
IR-192/194	10,100	2,219,300	1,293,000	22,000	139,900	
IR-102/141	16,182,800	14,086,500	4,544,100	62,400	15,014,000	
IR-134/195	64,700	230,000	465,800	35,300	499,100	15,700
VR-176	887,700	2,997,100	3,020,800	233,700	4,138,200	396,400
IR-133	1,240,300		433,000	19,100	1,063,400	
VR-100/125	4,186,500	115,900	342,800	31,200	966,500	37,000
IR-113	1,615,900	154,100	243,700	26,100	385,300	
R-5103		485,700	177,400		130,800	
R-5107	213,600	601,000	386,300	1,489,200	579,300	
R-5105	117,700					
R-5104	174,400					
Yonder		143,400	226,400		194,300	
Red Rio		455	32,800	68,500	150,000	
Oscura		17,400	168,900	19,700	6,900	
Mesa Low	27,400	50,000	213,900	10,800	455,200	
Mesa High	27,400	50,000	213,700	10,800	455,200	
Lava		85,300	641,600	104,500	187,000	
Talon	110,900	729,700	210,700	33,700	154,900	
Pecos	1,712,100	274,100	300			
Beak	447,900			31,200	1,140,500	

wildlife habitat includes the Rio Grande and Pecos rivers, which provide water for wildlife including bats, other mammals, and birds. Waterfowl and shorebirds migrate through and overwinter at Sevilleta and Bosque del Apache NWRs under VR-176, Brantley Lake under IR-192/194, Santa Rosa Lake under VR-100/125, and at Bitter Lake NWR near VR-100/125. Introduced populations of bighorn sheep are located in habitat under IR-102/141 and IR-192/194 (e.g., Sierra Diablo Mountains) in Texas, and under VR-176 in New Mexico. Large mammals and raptors are common in montane and shrub habitat located under the western portion of VR-176 and portions of IR-192/194, IR-134/195, and IR-102/141 (see Table 3.5-1). In addition, one of the largest known colonies of Mexican free-tailed bats is located in Carlsbad Caverns National Park near IR-102/141, IR-134/195, and Talon MOA.

White Sands Missile Range and Oscura and Red Rio Impact Areas. Chihuahuan Desertscrub is widespread on WSMR between 4,100 to 6,100 feet MSL and may be found on various land forms including lower mountain slopes, bajadas, and basin floors. The dominant plant species is creosotebush. Other common plants found in this community include honey mesquite, tarbush, ocotillo, fluff grass (*Erioneuron pulchellum*), black grama, alkali sacaton, and bush muhly (Dick-Peddie, 1993). The closed basin shrub vegetation occurs in basins that are characterized by the accumulation of salts, fine-textured soils, and sheet-flow drainage patterns. On WSMR, closed basin scrub occurs primarily on the floor of the Tularosa Basin and portions of the Jornada del Muerto Basin between 3,850 to 4,900 feet. It also occurs in arroyos and on alluvial flats.

The Oscura impact area is composed predominantly of Chihuahuan Desertscrub. Closed basin shrub type is a specialized Chihuahuan Desertscrub vegetation community type found within the Oscura impact area. Four types of closed basin scrub are represented on WSMR; the four-wing saltbush/tarbush type is predominant within the Oscura impact area (Dick-Peddie, 1993).

The Oscura impact area is a highly disturbed area immediately surrounding the targets. This disturbance is from ordnance use, maintenance, and fires. The Oscura impact area is composed of three main targets, each surrounded by a 300-foot diameter area of cleared ground. One of these targets also has four 25-foot wide cleared circles that surround the 300-foot diameter cleared area. Each of the three main targets also has a smaller strafing target area immediately north and south of the 300-foot diameter cleared area. These targets are in a 150 square foot area. There is also a 22,000-foot lead-in line to this target which is a cleared strip about 25 feet wide. There are two low-angle and one high-angle strafing targets at this range; these areas consist of 100 by 200-foot areas of cleared ground. Other cleared areas include the roads, firebreak, and range maintenance compound. The firebreak consists of existing roads 12 and 9 plus a graded firebreak on the north and west sides.

Roads and firebreaks are maintained twice per year. The targets are painted every four months with water-based paint. The ground at the strafing targets is disked every five days to stop bullets from skipping out of the target area. The targets and surrounding impact areas, out to 500 feet, are cleared every two months, and cleared

annually out to 1,000 feet. Every five years they are cleared, in an expanding radius, until no more than five pieces of ordnance are found in an acre. These clearances are performed by personnel walking the area and identifying expended inert ordnance, ordnance residue, or target area scrap. EOD personnel inspect the ordnance residue and separate the duds from those with expended spotting charges. Those that still contain spotting charges are rendered inert, and then all are placed into front-end loaders. These loaders traverse the area as necessary, and ultimately deliver this scrap to a central collection point.

Fires do occasionally result from use of ordnance (usually tracer bullets). No evidence of recent fires was observed at this range during the March 1997 survey; however, on average, about four fires occur each year on this range (Hoppes, 1997a). These fires are contained within the firebreak and are generally left to burn themselves out because the amount of grass and other fuel to support a fire is limited. If a fire goes beyond the firebreak, the WSMR firefighters are called in to control the fire. Under high fire-risk conditions, tracer bullets are prohibited.

Vegetation within the Red Rio impact area is composed of eight major plant community types (U.S. Air Force, 1994c). The valley floors and bajadas of the southern and eastern portions of the impact area contain scattered areas of Chihuahuan Desertscrub (mesquite type and closed basin scrub four-wing saltbush type, tarbush type, and creosotebush type). The lower slopes contain Desert Grassland and Plains Grassland (blue grama and alkali sacaton type). Mid-elevation slopes and mesas contain savanna and plains-mesa grassland (one-seed juniper and blue grama type). Higher slopes and the north-facing mid-elevational slopes contain coniferous woodland and montane scrub (pinyon pine and mountain mahogany type). The highest elevations of the Oscura Mountains are composed of Coniferous Woodland (pinyon pine type).

The Red Rio impact area is dominated by a grassland plant community with scattered yucca, cholla, saltbush, juniper, and other species. A burn occurred in 1995 (Hoppes, 1997a).

The main target areas consist of simulations of a 1.2 mile-long runway, airplanes, helicopters, a refinery and other buildings, and a FEBA array. The FEBA array consists of tanks, other armored vehicles, trucks, and other targets scattered throughout the hilly terrain. Only inert ordnance is used on these targets. The ground in much of this area has been recently burned. Within this area and near the LDT, there is a crater created by a 2,000-pound bomb. The LDT is about 3,000 feet in diameter. The main area where the live ordnance impact is a shallow basin 900 to 1,200 feet in diameter. The ground within this basin is devoid of vegetation and is full of smaller craters. There are also scattered craters from 500 and 2,000-pound live ordnance impacts outside the main impact crater but within about 3,000 feet of the center of the main impact area (Hoppes, 1997a).

In addition to the FEBA and main target, 50 tactical arrays are on the range. Each array may have four to five or more targets. Some of the largest arrays include a 36-vehicle truck convoy, a train, bridge, and tunnel. Some of the arrays have been

used for 20 years and have not been moved. Large inert ordnance (500 and 2,000-pound ordnance) are dropped on these target arrays.

Evidence of numerous small recent fires within the range were noted during the March 1997 field survey. A fire that may have burned 600 or more acres outside the firebreak was also observed. About 90 percent of these fires are started from tracer bullets fired by helicopters (Hoppes, 1997a). These fires are usually contained within the firebreak and are generally left to burn themselves out because the amount of grass and other fuel to support a fire is limited. If a fire goes beyond the firebreak, the WSMR firefighters are called to control the fire. Under high fire-risk conditions, tracer bullets are prohibited.

The firebreak around this range is about 12 miles long and is maintained twice per year and varies in width from 20 to 35 feet. There are also roads leading to each array which are maintained annually. Graders are used to maintain the roads, firebreak, and other cleared areas. There are 120 miles of roads at both ranges (Hoppes, 1997a).

Red Canyon Spring is along the same arroyo that passes through the Red Rio safety area but is separated by hills from the bombing range. The spring has flowing water which flows a short distance (about 150 feet). Salt cedar was the only woody species observed and is found up to 180 feet downstream. Saltgrass and dropseed are common in the area. The dropseed formed 15-foot wide bands on either side of the 15 foot-wide arroyo near the spring. Scattered salt cedar, apache plume, Mormon tea, four-winged saltbush, barberry, squawbush, seep willow, and mesquite are found in the arroyo further downstream.

While few amphibians would be found in the arid habitat of the impact areas, there is potential to find them, particularly in riparian portions of the various habitats found within the impact areas. The tiger salamander *(Ambystoma tigrinum)*, New Mexico spadefoot toad *(Spea multiplicata)*, plains spadefoot toad *(Spea bombifrons)*, and Couch's spadefoot toad *(Scaphiopus couchii)* can all be found in the desert scrub or closed basin scrub riparian habitats within the Oscura impact area. The red-spotted toad *(Bufo punctatus)*, green toad *(B. debilis)*, Woodhouse toad *(B. woodhousii)*, and bullfrog *(Rana catesbeiana)* could also be found in the riparian portions of the closed basin scrub habitat (Burkett, 1994; WSMR, 1995).

Reptiles are an abundant component of the desert habitats. Snakes are the most diverse reptile, while lizards are the most abundant. Common reptiles that could potentially exist on the Oscura impact area are: roundtail horned lizard (*Phrynosoma modestum*) in the closed basin scrub, and New Mexico whiptail (*Cnemidophorus neomexicanus*), and New Mexico garter snake (*Thamnophis sirtalis dorsalis*) in riparian habitat of the closed basin scrub (Burkett, 1994; WSMR, 1995).

The Oscura impact area has the potential of providing habitat to almost 300 bird species. Surveys have shown that the most common bird species are the black-throated sparrow, Northern mockingbird (*Mimus polyglottos*), mourning dove

(*Zenaida macroura*), and Western kingbird (*Tyrannus verticalis*) (U.S. Army, 1989; 1990). Common hawks include Swainson's hawk and red-tailed hawk. The most abundant raptor is the American kestrel (*Falco sparverius*), which nests in open and forest-edge habitats. Other common raptors include turkey vulture (*Cathartes aura*), burrowing owl, and barn owl (*Tyto alba*). Many neotropical migrants (warblers, flycatchers, hummingbirds, vireos, thrushes, swallows, sparrows, finches, and more) use Oscura and Red Rio as either breeders or migrants and inhabit virtually all of the vegetation types. There is relatively little existing habitat for water-dependent birds within either of the impact areas. Most of the habitat available for these birds within the Oscura impact area is ephemeral, consisting primarily of stock tanks. Waterfowl (ducks, geese), wading birds (herons, egrets), shorebirds (plovers, sandpipers), gulls, and terns are the most common types of water-dependent birds encountered within the impact areas.

The most common small mammals at WSMR (where Oscura and Red Rio impact areas are located) are Merriam's kangaroo rat (*Dipodomys merriami*), Ord's kangaroo rat (*Dipodomys ordii*), and deer mouse (*Peromyscus maniculatus*) (U.S. Army, 1989; 1990). Typical predators of these rodents are the coyote (*Canis latrans*), swift/kit fox (*Vulpes velox*), and common gray fox (*Urocyon cinereoargenteus scottii*). The coyote can be found in almost every habitat type, while the swift/kit fox inhabits the mountains and foothills adjacent to the impact areas. The mountain lion (*Felis concolor*) can be found in and adjacent to mountains of the Oscura impact area, while the bobcat (*Lynx rufus*) inhabits a wide range of desert, grassland, and mountainous habitats. Approximately 20 species of bats also occur or potentially occur in caves and crevices in the mountains and associated cliffs adjacent to the impact areas.

Melrose Range. Vegetation on Melrose Range is characterized as Plains and Great Basin Grassland vegetation. Vegetation is dominated by grass species including blue grama (*Bouteloua gracilis*), hairy grama (*Bouteloua hirsuta*), buffalograss, alkali sacaton (*Sporobolus airoides*), and little bluestem (*Schizachryium scoparius*). Common shrub species include rabbitbrush, yucca, and snakeweed. Wildlife reported to likely be present in the area are typical of Plains and Great Basin Grassland vegetation as previously discussed (U.S. Air Force, 1985; 1995).

McGregor Range. Vegetation throughout McGregor Range and the NTC training option sites has been delineated by the New Mexico Natural Heritage Program and obtained through Fort Bliss natural resource staff (see Figure 3.5-2). Both sites generally lie within the Desert Grassland vegetation type defined by Dick-Peddie (1993); however, part of the Tularosa Basin site is also in the boundaries of Chihuahuan Desertscrub vegetation. Therefore, the West Otero Mesa site is primarily grass-dominated, whereas the Tularosa Basin site is shrub-dominated.

The 5,120-acre West Otero Mesa site represents about three percent of the portion of the approximate 163,000 acres of Otero Mesa that is on McGregor Range and 0.4 percent of the entire Otero Mesa landform that extends south and east into Texas and is about 1,202,000 acres in size. The vegetation on this site is primarily grass-dominated (3,430 acres of shortgrass); however, one-third of the site is shrub-

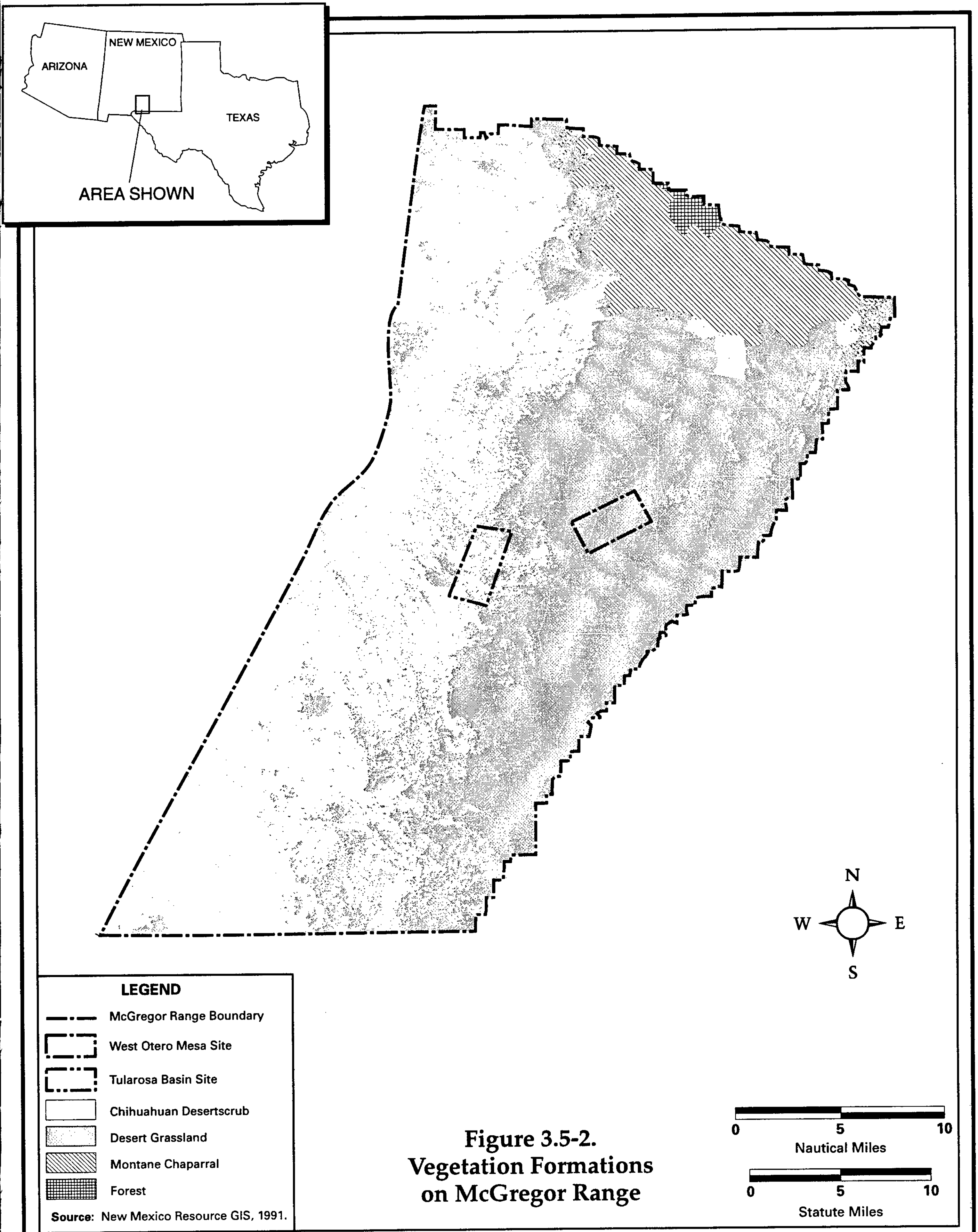

**Figure 3.5-2.
Vegetation Formations
on McGregor Range**

dominated (1,690 acres of desert shrub). The northernmost corner of the site (about 1,780 acres) is on Lozier Rock Outcrop soil type and is dominated by creosotebush and tarbush. Other common plant species include black grama, soaptree yucca (*Yucca elata*), and mesquite. Vegetation productivity for this type generally ranges between 250 and 650 pounds/acre (USDA, 1981). Philder Very Fine Sandy Loam soil (2,260 acres) is found primarily on the middle third of the site. Common species include blue grama, black grama, cholla (*Opuntia imbricata*), and soaptree yucca. Vegetation productivity for this type generally ranges between 600 and 1,000 pounds/acre (USDA, 1981). Philder Armesa Association soil (1,330 acres) is found surrounding minor drainages in the central and southern portions of the site. Plant species on these soil types are a mixture of species from between Lozier Rock Outcrop and Philder Very Fine Sandy Loam soil sites and include blue grama, black grama, cholla, creosotebush, and tarbush. Vegetation productivity for this type generally ranges between 600 and 1,450 pounds/acre (USDA, 1981). A limited amount of Armesa Very Fine Sandy Loam soil (50 acres) is also found in association with drainages and swales at the south corner of the site. Common plant species include blue grama, black grama, soaptree yucca, cholla, New Mexico needlegrass, and tobosa grass. Vegetation productivity for this type generally ranges between 900 and 1,450 pounds/acre (USDA, 1981).

Vegetation on the Tularosa Basin site is shrub-dominated on all four soil types delineated on the West Otero Mesa site. The eastern portion of the site (about 1,830 acres) is on Lozier Rock Outcrop soil type and is dominated by creosotebush and tarbush. Other common plant species include black grama, soaptree yucca, and mesquite. Vegetation productivity for this type generally ranges between 250 to 650 pounds/acre (USDA, 1981). Nickel Tencee Simona Complex soils are the most common (2,230 acres). Common plant species include creosotebush, mesquite, tarbush, four-wing saltbush, soaptree yucca, and black grama. Mimbres Tome Complex soils cover about 1,164 acres and are dominated by creosotebush, tarbush, dropseed, and mesquite. A very limited amount of Rockland Lozier Complex soils are present (25 acres). Species common to this soil type are creosotebush, four-wing saltbush, soaptree yucca, black grama, tarbush, and cholla.

Vegetation cover and composition reflect soils and climate as influenced by past historic grazing, current grazing under BLM management, and other factors including wildfires, ordnance impacts, and other human disturbances. Based on measurements of monitoring plots in 1994, bare ground ranged between 42 and 71 percent and vegetation basal cover averaged between 48 and 82 percent cover (Geo-Marine, 1994). This data was collected as part of the U.S. Army Long-Term Condition Trend Analysis (LCTA) program that is intended to monitor broad changes in biological resource trends across the installation. The general area on Otero Mesa that includes the NTC was identified as "one of the most significant high quality areas on Fort Bliss," and represents one of the largest occurrences of Chihuahuan Desert grasslands in the U.S. (U.S. Army, 1997). The report further characterizes the general area as not appearing to have been extensively stocked and with low incidence of shrub and weedy species and a general absence of exposed, compacted, or eroded soils (U.S. Army, 1997). However, 1996 field vegetation surveys of the NTC site found that the site continues to be heavily grazed (the BLM

management target is about 50 percent annual biomass removal), and that shrubs and other invasive species are abundant and appear to be increasing (based on the age structure of the shrubs). In addition, the proposed West Otero Mesa NTC site has signs of past plowing and blading (probably occurring in the 1930s), has shrapnel present and associated ground disturbance, and two or three fires have occurred on the site in the past 18 months. The variability among the descriptions is in part related to the location of sample points, and is also related to the scale of the reviewer's interest. Both the LCTA and the U.S. Army (1997) description of the Otero Mesa are focused on large-scale descriptions. In contrast, the vegetation descriptions of the West Otero Mesa and Tularosa Basin NTC site are focused on much smaller, specific sites.

Animal species common to the NTC training option sites are listed in Table 3.5-3. These species are common to the Chihuahuan Desertscrub and Plains and Great Basin Grassland vegetation predominant on the NTC sites and based on surveys conducted in the 1980s and 1990s (Bashore, 1997; Kozma and Mathews, 1995; Pidgeon and Mathews, 1996; Taffanelli and Meyer, 1995; Taffanelli et al., 1996). In addition, the escarpment between the Tularosa Basin and West Otero Mesa NTC sites provides potential habitat for bat roosts and raptor nest sites, and serves as a topographic feature for migratory birds. A total of seven species of amphibians and 34 species of reptiles have been observed on Fort Bliss; an additional 32 species have the potential to occur (Bashore, 1997). The seven amphibian species are toads, including spadefoot toads, which are most likely present on both NTC sites. Of reptiles, 19 lizards and 15 snake species have been recorded on Fort Bliss. The largest number of lizard and snake species occur in the grassland habitat (17 and 13 species) followed by the desert shrublands (13 and 11 species), with the remaining species associated with the Sacramento and Organ mountains. Some species, such as the Western whiptail, Texas short-horned lizard, Western diamondback rattlesnake, and bull snake, are found in essentially all areas on Fort Bliss; others, such as the leopard lizard (*Crotaphytus wislizenii*, have been reported only from the desert shrubland habitat and other species, such as the Mojave and prairie rattlesnakes (*Crotalus scutulatus* and *C. viridis*), have been reported only from the grassland habitat on Otero Mesa, although they are found throughout their ranges in the Southwest.

A total of 320 species of birds have been recorded from Fort Bliss (Fort Bliss, 1996). In recent years, detailed studies of the bird life in various habitats on Fort Bliss have been initiated. In a 1996 study, six sites were sampled in desert shrub habitat dominated by sandsage (*Artemisia filifolia*), mesquite, creosotebush, and white-thorn bush (Pidgeon and Mathews, 1996). Between 42 and 54 species were observed in desert scrub habitat of the Tularosa Basin. The black-throated sparrow was the most common species recorded in all four habitats, comprising 30 percent of the birds tallied in the white-thorn habitat and 47 percent of the birds in the sandsage habitat. The Western kingbird was the second most common species in the sandsage and mesquite habitats while the Scott's oriole and ash-throated flycatcher were the second most common species in the creosotebush and white-thorn habitat. The mourning dove, pyrrhuloxia, cactus wren, house finch, and verdin (*Auriparus flaviceps*) were other common species encountered. Breeding bird studies in arroyo-

Table 3.5-3. Animal Species Common or Typical to the Habitat of the West Otero Mesa and Tularosa Basin NTC Sites

	Common Name	Scientific Name	West Otero Mesa	Tularosa Basin
Mammals	badgers	*Taxidea taxus*	X	X
	antelope ground squirrel	*Ammospermophilis interpres*	X	
	Merriam's kangaroo rat	*Dipodomys merriami*	X	
	deer mouse	*Peromyscus maniculatus*	X	X
	cotton rat	*Sigmodon hispidus*	X	X
	harvest mice	*Reithrodontomys spp.*	X	X
	pocket mice	*Perognathus spp.*	X	X
	grasshopper mice	*Onychomys spp.*	X	X
	wood rats	*Neotoma spp.*	X	X
	ringtail	*Bassariscus astutus*	X	X
	pronghorn	*Antilocapra americana*	X	
	mule deer	*Odocoileus hemionus*	X	X
	coyote	*Canis latrans*	X	X
Birds	horned larks	*Eremophila alpestris*	X	
	cactus wren	*Campylorhynchus brunneicapillus*	X	X
	Northern mockingbird	*Mimus polyglottos*	X	X
	Crissal thrasher	*Toxostoma dorsale*	X	X
	black-throated sparrow	*Amphispiza bilineata*	X	X
	Scott's oriole	*Icterus parisorum*	X	X
	ashthroated flycatcher	*Myiarchus tyrannulus*	X	X
	mourning dove	*Zenaida macroura*	X	X
	red tailed hawk	*Buteo jamaicensis*	Primarily winter	Primarily winter
	savannah sparrow	*Passerculus sandwichensis*	Winter only	
	vesper sparrow	*Pooecetes gramineus*	Primarily winter	X
	sage sparrow	*Amphispiza belli*	Winter only	
	chestnut-collared longspurs	*Calarius ornatus*	Winter only	
	Northern harrier	*Circus cyaneus*	Winter only	Winter only
	ferruginous hawks	*Buteo regalis*	Winter & Spring only	
	house finch	*Carpodacus mexicanus*	X	X
	Western kingbird	*Tyrannus verticalis*	X	X
	blacktailed gnatcatcher	*Polioptila melanura*		X
	Eastern meadowlark	*Sturnella magna*	X	Limited
	Chihuahua raven	*Corvus crytoleucus*	X	X
	Swainson's hawk	*Buteo swainsoni*	X	X
	kestrel	*Falco sparverius*	X	X
	lark sparrow	*Chondestes grammacus*	X	
	curve-bill thrasher	*Toxostoma curvirostre*		X

riparian habitat and surrounding uplands in the Chihuahuan desert biome have shown that black-throated sparrow, Northern mockingbird, verdin, brown-headed cowbird (*Molothrus ater*), mourning dove, and ash-throated flycatcher (*Myiarchus cinerascens*) are the most common species (Kozma, 1995; Kozma and Mathews, 1995). In 1996, six sites were sampled for breeding birds in the black grama grasslands and the Otero Mesa grasslands (dominated by blue grama grass) (Pidgeon and Mathews, 1996). About 40 bird species were recorded on the mesa. The horned lark (*Eremophila alpestris*) was the most common species observed in the black grama mesa grasslands. Other common breeding bird species were the black-throated sparrow, mourning dove, Northern mockingbird, common nighthawk (*Chordeiles minor*), Scott's oriole, and ash-throated flycatcher.

Swainson's hawk and turkey vulture were the most common raptors in the desert observed during spring and summer of 1996 (Pidgeon and Mathews, 1996). Other species observed were the red-tailed hawk, American kestrel, Northern harrier (*Circus cyaneus*), and prairie falcon. During surveys of the Otero Mesa escarpment in March 1997, one breeding pair of prairie falcon and a prairie/peregrine falcon hybrid was observed along the escarpment in the area of Rough Canyon. Numerous stick nests and a number of golden eagles (*Aquila chrysaetos*) were also observed but nesting was not confirmed. The red-tailed hawk, American kestrel, and Northern harrier were commonly seen in the desert shrub habitat (SAIC, 1997). Data collected during nine surveys along a 15-mile route in the desert shrubland habitat during wintering bald eagle surveys indicate that the golden eagle and red-tailed hawk were the most common species (Tafannelli et al., 1996). The Otero Mesa is a grassland-dominated area and raptors observed during the 1996 breeding season included the turkey vulture, Swainson's hawk, red-tailed hawk, American kestrel, Northern harrier, prairie falcon, and Cooper's hawk (*Accipiter cooperii*) (Pidgeon and Mathews, 1996). Other species observed on Otero Mesa were the golden eagle, merlin (*Falco columbarius*), burrowing owl, and great horned owl (*Bubo virginianus*). The ferruginous hawk has been observed on the mesa in the winter and spring (Tafanelli and Meyer, 1995; and Vonfinger et al., 1994). The red-tailed hawk was the most common raptor observed on Otero Mesa during the winters of 1994-95 and 1995-96. The golden eagle and American kestrel were also fairly common wintering species.

Mule deer numbers have historically been low on McGregor Range, south of State Road 506 where the proposed NTC would be located. From 1991 through 1994, 24 to 36 hunting permits were issued with between one and 10 animals being harvested each year. The mule deer population north of State Road 506 on McGregor Range is much larger, with over 150 hunting permits issued each year from 1991 through 1994. Between 52 and 113 animals were harvested each year from this northern portion of McGregor Range. Deer hunting on McGregor Range has been closed for two years (Madsen, 1997b) because populations are declining. The decline is thought to be due to poor fawn survival during the drought when food supplies were low. The pronghorn antelope population on McGregor Range has been relatively stable and a two-day permitted hunt is held annually. The majority of the animals occur on the Otero Mesa portion of the range. This population of pronghorns is thought to be one of the better populations in terms of number and size (body weight and

horns). The number of animals observed during aerial surveys of Otero Mesa during March through May have ranged from a low of about 100 animals in 1992 to over 800 in 1995. This represents about four percent of the number of animals observed statewide during surveys. Mountain lions are known to occur on portions of McGregor Range north of State Road 506. No lions have been harvested south of State Road 506. In addition, the use of the area by lions for hunting or as a travel corridor would be very low (Hayes, 1997).

3.5.4 Protected and Sensitive Species

Protected and sensitive species that may be in the area affected under the proposed action have been identified through contact with USFWS, TPWD, and NMDGF. In addition, other species information was obtained from contacts with or reports from USFS, BLM, private landowners, research scientists, Fort Bliss, and Holloman AFB and Arizona Game and Fish Department. These include Federally listed threatened and endangered species (see Table 3.5-4), species proposed for listing, Federal candidates, and state-protected species. During these consultation meetings, Mexican spotted owl, peregrine falcon, aplomado falcon, bald eagle, Southwestern willow flycatcher, whooping crane, and Mexican gray wolf were highlighted by USFWS as the threatened and endangered species that may be most likely affected by the proposed action.

3.5.5 Wetlands and Waters of the U.S.

In general, Waters of the United States are defined as all waters used in the past, currently used, or may be used in the future for interstate or foreign commerce and all other waters (including intermittent streams and playa lakes), the use, degradation, or destruction of which could affect waters used for interstate or foreign commerce by visitors or residents using equipment manufactured in other states or countries.

Jurisdictional wetlands are defined as areas having soil, hydrologic, and vegetation characteristics meeting requirements described in the *1987 Army Corps of Engineers Wetland Delineation Manual* (USACE, 1987).

Holloman Air Force Base. No jurisdictional or nonjurisdictional wetlands are known to exist within the cantonment area of the base where construction activities are proposed. However, about 870 acres (36,890 linear feet) of jurisdictional waters including Waters of the U.S. and jurisdictional wetlands are present on Holloman AFB (USACE, 1996a). The most common jurisdictional habitat types on Holloman AFB include ephemeral streams, permanently flooded lakes and basins, and alkali flats. A high percentage of jurisdictional wetlands and Waters of the U.S. are near Lake Holloman (about 160 acres), Stinky Playa (nearly 80 acres), and Lagoon G (nearly 70 acres), which are south and west of the cantonment area where proposed facility construction would occur. The majority of these areas (about 255 acres) are permanently flooded lakes and basins with about 55 acres in wetlands. Outflow from the wastewater treatment facility and storm water drainage ditches are the primary water sources for these areas.

Table 3.5-4. List of Protected and Sensitive Species Known or Potentially Present Within the ROI

Scientific Name	Common Name	Status[1]	Comments
Plants[2]			
Cereus greggii	night-blooming cereus	SOC[3]	Not found during 1997 survey, but potentially present on proposed Tularosa Basin NTC and existing McGregor target.
Neolloydia intertexta var. dasyacantha	pineapple cactus	SOC	In 1995, 19 populations were observed along the 98-ft corridor of the numbered roads within the safety fan of Red Rio but outside the primary impact area.
Toumeya papyracantha	grama grass cactus	SOC	Not found during 1997 survey, but potentially present on proposed West Otero Mesa NTC. Known to occur on Holloman AFB and near the West Otero Mesa NTC. In 1995, 1 population was identified outside of the Red Rio safety fan along Range Road 11.
Fish			
Cyprinodon tularosa	White Sands pupfish	NM Threatened	Known only in Malpais Spring, Mound Spring, and Salt Creek several miles south of Oscura impact area on WSMR and on Holloman AFB (Lost River/Malone Draw). Protected by cooperative agreement signed by NMDGF, WSMR, and Holloman AFB.
Meda fulgida	spikedace	U.S. Threatened	Proposed critical habitat beneath airspace includes portions of Upper Verde River, Gila River, and Aravaipa Creek in New Mexico. No critical habitat is beneath airspace in Arizona.
Oncorhynchus apache	Apache trout	U.S. Threatened	Restricted to cold water mountain streams through conifer and spruce-fir forests and montane meadows and grasslands.
Tiaroga cobitis	loach minnow	U.S. Threatened	Proposed critical habitat is Aravaipa Creek, Blue River, Cambell Blue Creek, San Francisco River, Dry Blue Creek, Tularosa River, east, west, and middle forks and upper Gila River.
Xyrauchen texanus	razorback sucker	U.S. Endangered	Found in Horseshoe Reservoir (Maricopa Co. and in slow-moving rivers and streams in Greenlee and other counties.
Amphibians and Reptiles			
Crotalus lepidus lepidus	mottled rock rattlesnake	NM Threatened	Associated with rock outcrops. Known in Hueco Mountains and Otero Mesa escarpment on McGregor Range.
Phrynosoma cornutum	Texas horned lizard	SOC TX Threatened	Associated with desert grassland and desert shrub vegetation. Found throughout WSMR, McGregor Range, and Holloman AFB.
Rana chiricahuensis	Chiricahua leopard frog	Candidate	Requires permanent water source. Population north of Gila River thought to be closely related but undescribed species. Habitat not present on McGregor Range.
Birds			
Accipiter gentilis	Northern goshawk	SOC	Nests known in Cibola, Lincoln, Gila, and Apache-Sitgreaves NFs. Habitat in the Southwest is primarily ponderosa pine, mixed species, and spruce-fir forest types (USFS, 1992). Also located at Holloman AFB in wetlands and Lake Holloman area. Habitat not present on McGregor Range.
Ammodrammus bairdii	Baird's sparrow	SOC NM Threatened	May be found infrequently throughout shrub-grassland habitats of southern New Mexico (e.g., McGregor Range and Holloman AFB) during fall migration (August through October) and winter, and rarely during spring migration and other times of the year. No birds observed during 1997 surveys.
Arremonops artivirgatus rutivirgatus	Texas olive sparrow	SOC	Common resident in south Texas, associated with brushy habitat. At extreme edge of range in west Texas. Habitat not present on McGregor Range.
Athene cunicua	Western burrowing owl	SOC	Resident of shrub-grassland north of the proposed West Otero Mesa NTC. Not observed during 1997 site survey. Common including cantonment area.
Buteo albonotatus	zone-tailed hawk	TX Threatened	Breeds in south Texas and southern New Mexico. Primarily associated with canyons and streams.
Asturina nitidus maximus	Northern gray hawk	TX Threatened, SOC	Year-round resident in south Texas and southern New Mexico. At extreme northern edge of range. Associated with woodlands and streams. Known to occur on Holloman AFB (water well field area). Habitat not present on McGregor Range based on 1997 surveys.
Buteo regalis	ferruginous hawk	SOC	Winter resident and may breed in area. Associated with grassland and shrub vegetation types. Not observed during breeding bird, raptor, and other surveys conducted on McGregor Range in 1997.
Buteogallus anthracinus	common black hawk	NM Threatened; TX Threatened	Ranges from Arizona through south Texas and into South America. It is known to be rare to infrequently observed in southern New Mexico and south Texas associated in the summer with large river drainages (e.g., Rio Grande, Gila, Mimbres). The bird probably has declined as riparian habitat has been lost. The black hawk is a riparian obligate. In Arizona it is found in the Apache-Sitgreaves, Coconino and Coronado NFs (NMDGF, 1997). Habitat not present on McGregor Range.

Table 3.5-4. List of Protected and Sensitive Species Known or Potentially Present Within the ROI (continued)

Scientific Name	Common Name	Status[1]	Comments
Charadrius alexandrinus nivosis	Western snowy plover	SOC	Inhabits alkali flats and sandy areas near water. Nests at Bitter Lake NWR and Stinky Playa, Lagoon G, and constructed wetlands on Holloman AFB. Habitat not present on NTCs and very limited around water tanks on McGregor Range.
Charadrius melodus	piping plover	U.S. Threatened NM Endangered	Migrant associated with wetlands and playas. Habitat not present on McGregor Range, based on 1997 surveys.
Charadrius montanus	mountain plover	U.S. Candidate	Migrant and occasional summer resident in west Texas and New Mexico. Found in grassland communities. Also observed on Holloman AFB in the summer. Limited habitat present on McGregor Range; no birds observed during 1997 survey.
Chlidonias niger	black tern	SOC	Infrequent migrant. Associated with marshes and open water. Found on Holloman AFB from spring through fall. Habitat not present on McGregor Range.
Columbina passerina	common ground dove	NM Threatened	Year-round resident in shrub habitats.
Cyanthus latirostris	broad-billed hummingbird	NM Threatened	Summer resident, rarely breeds in extreme southwest New Mexico south into Mexico. Found in canyons and arroyos.
Dendroica chrysoparia	golden-cheeked warbler	U.S. Endangered	Located in central Texas. Associated with mature juniper stands - not found in west Texas. Habitat not present on McGregor Range.
Elanoides forficatus	American swallow-tailed kite	TX Threatened	Very rare in south Texas. Associated with marshes and rivers in Texas, primarily found on the Gulf Coast. Habitat not present on McGregor Range.
Empidonax traillii extimus	Southwestern willow flycatcher	U.S. Endangered	Primarily associated with arroyos and riparian habitat. It is known to occur in the region, especially near the Rio Grande and in Gila and Apache-Sitgreaves NFs. There are approximately 100 breeding pairs in New Mexico. The flycatcher is limited due to riparian destruction. A 1993 survey indicated less than 35 occupied sites, while a 1994 survey indicated at least 55 occupied sites (NMDGF, 1997).
Falco femoralis septentrionalis	Northern aplomado falcon	TX Endangered and U.S. Endangered	Habitat in ROI is desert grassland; birds nest in tall yucca and shrubs (Ligon, 1961). Closest population is located in Chihuahua, Mexico about 150 miles south of El Paso, Texas (Vonfinger et al. , 1994). The most recent known nesting attempt in the U.S. was in south Texas in 1995. Unoccupied potential habitat is present on Otero Mesa of McGregor Range, in portions of WSMR and under portions of IR-102/141. A juvenile bird was observed in 1996 near Las Cruces. No falcons were observed during surveys of McGregor Range in 1994 or 1995. During May 1997 surveys, an immature falcon was observed (but not confirmed) in grassland habitat in the Tularosa Basin area. It has been hypothesized that vegetation basal cover and height may be less on McGregor Range compared to occupied habitat in Mexico. Reduced vegetation may reduce use of the area by small birds, which are primary prey item of this falcon. (Locke, 1996). There have been 8 verified sightings in the last 5-6 years in New Mexico and Texas: Otero County, 1991 and 1992; Doña Ana County, 1996; Grant County, 1997 (Leal, 1996; Williams, 1997), and 2 sightings in west Texas. The overall decline of the species is believed to have been caused by brush encroachment (habitat alteration), overcollecting, and organochlorine contamination (NMDGF, 1997).
Falco peregrinus anatum	American peregrine falcon	U.S. Endangered	Known to nest in the general region on cliffs and mountains that overlook wooded areas (e.g., Apache-Sitgreaves, Gila, Cibola, and Lincoln NFs). Breeding population appears stable statewide (NMDGF, 1997); however, it is difficult to ascertain the actual status as habitat occupancy rates have increased over the last few years, while reproduction has decreased 34% since 1988 (Williams, 1997). No nest sites are present on the Otero Mesa escarpment, which provides marginal habitat. Peregrine falcon nests are known in the area of VR-176 (Gila Wilderness) and near IR-192/194, IR-134/195, IR-102/141 (Sacramento Mountains and Guadalupe Mountains National Park) and VR-100/125 (White Oak Mountains). Limited unoccupied suitable but marginal habitat occurs along Guadalupe Rim near Pickett Hill (under Talon MOA, and IRs 102/141 and 134/195) and Pup Canyon under Talon MOA. Regular visitor to Holloman AFB in spring and fall.
Glaucidium brasilianum cactorum	Cactus ferruginous pygmy-owl	U.S. Endangered	Uses mature cottonwoods, willows, mesquite, and desert scrub in close proximity to rivers. Proposed critical habitat and most historic range is outside of airspace; however, proposed habitat around Bonita Creek and Gila River are near airspace. Fewer than 20 observations were made between 1971 and 1988. Only 3 owls were observed during intensive surveys in 1992 and 1993. No individuals or habitat present within airspace ground track.

Table 3.5-4. List of Protected and Sensitive Species Known or Potentially Present Within the ROI (continued)

Scientific Name	Common Name	Status[1]	Comments
Grus americana	American whooping crane	U.S. Endangered	Migrant through Texas prairies, primarily east of west Texas. Winter habitat along Texas Gulf Coast. Experimental population winters in Bosque del Apache NWR under VR-176. The experimental flock was considered unsuccessful, with only 2 males remaining (Hale, 1997). The overall population decline of the whooping crane is due to habitat loss and alteration.
Gymnogyps californianus	California condor	Endangered	USFWS is considering the possible introduction of the species into one of 3 locations in 1999 (Mesta, 1997). Two locations are within the ground track of VR-176 near Truth or Consequences and on the Ladder Ranch (also near Truth or Consequences). At this time, the project has not been fully funded and USFWS has not determined whether to move forward with this project.
Haliaeetus leucocephalus	bald eagle	TX Endangered, U.S. Threatened	Winter migrants have been observed in the general region, including Fort Bliss (Tafanelli and Meyer, 1995). Irregularly seen at Holloman AFB. Winter roosts known along Rio Grande (e.g., Elephant Butte and Caballo Reservoirs, and Sevilleta and Bosque del Apache NWRs) and Pecos River (e.g., Sumner Lake, Santa Rosa Lake, Brantley Lake) under VR-125 and IR-192/194. Between 60 and 100 birds observed along lower Rio Grande and 30 and 40 birds observed in upper Pecos River area in 1994-1995 (Williams, 1997). About 10 birds winter in the southern Sacramento Mountains north of McGregor Range. As of 1996, 2 pair nest in NM; one in Sierra County (Ladder Ranch), and one in Colfax County (Williams, 1997). In the early 1980s, 220 individuals overwintered in NM; in 1994, 430 individuals overwintered. Winter and migrant populations appear to have increased in NM in recent years. In 1963, there were only 417 breeding pairs in the lower 48 states; in 1994, there were 4,452 pairs (NMDGF, 1997).
Icterus cucullatus cucullatus	Mexican hooded oriole	SOC	Summer (breeding) resident in portions of west Texas and southwest New Mexico. Associated with palms, cottonwoods, trees with shrubby understory -riverine systems (e.g., Rio Grande).
Lanius ludovicianus migrans	loggerhead shrike	SOC	Common, year-round resident. Associated with open shrub-grassland, savannah habitats. Uncommon year-round resident at Holloman AFB.
Mycteria americana	wood stork	TX Threatened	Irregularly found in Texas along Gulf Coast. Associated with wetlands.
Passerina versicolor	varied bunting	NM Threatened	Generally associated with thickets near water in extreme south portion of New Mexico and Texas (e.g., along Rio Grande River).
Pelecanus occidentalis	brown pelican	U.S. Endangered NM Threatened	Coastal resident. Very rarely observed at Holloman AFB (Lake Holloman). Rarely found in west Texas near large water bodies. Habitat not present on McGregor Range.
Plegadis chihi	white-faced ibis	TX & NM Threatened; SOC	Migrant in west Texas and New Mexico. Associated with marshes and wetlands. Regular migrant on Holloman AFB.
Sterna antillarum anthalassos	interior least tern	TX Endangered, U.S. Endangered	Historical distribution associated with river systems and playa lakes. Currently, the nearest breeding colony is at Bitter Lake NWR. Rare summer visitor on wetlands at Holloman AFB. The species may be observed in other areas (e.g., Eddy, Chaves, Otero, and Lincoln counties during migration season). New Mexico's breeding population has declined from 60 birds in the early 1960s to only 3 nesting pair in 1987-90 surveys, and 5-7 pair in 1991-93 surveys. Productivity remains poor (NMDGF, 1997). Its decline has been associated with degradation of prime nesting habitat. Habitat not present on McGregor Range.
Strix occidentalis lucida	Mexican spotted owl	U.S. Threatened	The Mexican spotted owl occurs in woodlands of the mountain areas. This species nests in Lincoln NF. Formerly designated critical habitat within and near IRs 102/141, 134/195, 192/194, and VR-176. A 1993 survey estimated that 2,160 Mexican spotted owls are in New Mexico (NMDGF, 1997). There are 2 large populations in the Gila Mts.: one in the Lincoln Mts. and one in Apache-Sitgreaves NF. Also present in Cibola NF. The overall trend is of concern due to decreasing habitat availability (Williams, 1997).
Trogon elegans	elegant trogon	NM Threatened	Rare summer resident in southeast Arizona and incidental in south Texas. Habitat is forest and woodlands.
Vireo atricapillus	black-capped vireo	TX Endangered and U.S. Endangered	Summer resident in central Texas. Associated with oak and juniper thickets and canyons or central Texas. May be infrequently found in west Texas (Brewster County) in the vicinity of IR-102/141. Habitat not present on McGregor Range.
Vireo bellii arizonae	Bell's vireo	NM Threatened	Summer resident associated with shrubland and thickets near water.
Vireo vicinior	gray vireo	NM Threatened	Summer resident associated with pinyon-juniper, oak, and open shrubland habitat.

Table 3.5-4. List of Protected and Sensitive Species Known or Potentially Present Within the ROI (continued)

Scientific Name	Common Name	Status[1]	Comments
Mammals			
Antiliocapra americana	pronghorn antelope	Endangered	Protected subspecies found on Goldwater Range. Habitat of this subspecies is not within ground track of VR-176.
Canis lupus baileyi	Mexican gray wolf	U.S. Endangered	Extinct in U.S. since at least 1970 (USFWS, 1989). Wandering individuals from Mexico may occasionally occur in NM (NMDGF, 1997). A group of 10 (5 pair) captive wolves at the Sevilleta NWR is awaiting release into the wild -- proposed release onto the Blue Range Primitive Area, Apache-Sitgreaves NF is tentatively scheduled for Feb./Mar. 1998 (Brown, 1997; Parsons, 1997; Buchanan, 1997; Parsons and Bedell, 1997).
Cryptotis parva	least shrew	NM Threatened	Associated with grassland habitats. Known distribution in Texas is east of Big Bend National Park.
Cynomys ludovicianus arizonensis	Arizona black-tailed prairie dog	SOC	Associated with shortgrass and desert grassland vegetation. Small populations are known to occur on Otero Mesa in McGregor Range. Potential habitat but no species on NTC sites.
Euderma maculatum	spotted bat	TX Threatened; SOC	Associated with numerous vegetation habitats from desert shrub to forest communities. Found in the Jemez, San Mateo, and Mogollon Mts., and Mt. Taylor. NM surveys in 1983 indicated declining populations. Observed on Holloman AFB. The bat is largely unknown in AZ. Population limiting factors are largely unknown; however, it is speculated that pesticide use and subsequent insect ingestion may be the cause (NMDGF, 1997).
Eumops perotis californicus	greater Western mastiff bat	TX Threatened; SOC	Roosts in cliffs and crevices of cliffs and mesa rims. Colonial and insectivorous. Limited low-quality habitat present on escarpment at McGregor Range.
Felis onca	jaguar	Endangered	Generally prefer warmer, tropical climates associated with water and are rarely found in extensively arid regions (Hoffmeister, 1986; USFWS, 1997). Jaguars inhabit dense chaparral and timbered portions of their range. Historical range extended from Argentina north into Louisiana, Texas, New Mexico, Arizona, and possibly southern California (Johnson and Van Pelt, 1997; USFWS, 1997). Currently, no known resident populations in U.S. Between 1961 and 1994 there were 7 confirmed observations of jaguars; 4 in Cochise and Santa Cruz counties, AZ (Girmendonk, 1994). In 1996, 2 sightings occurred in Pima County and Cochise County, AZ.
Geomys bursarius arenarius	desert pocket gopher	SOC	Associated with sandy and friable desert soils and grass-shrub vegetation types, especially in valley floors. In Texas, found primarily in south Texas and near El Paso. Limited potential habitat on Tularosa Basin area of McGregor Range, including proposed NTC site. Potential habitat exists on Holloman AFB, especially in the western portion.
Leptonycteris nivalis	Mexican long-nosed bat	TX Endangered; US Endangered	Inhabits deep caverns. Nectar feeder, especially agave.
Mustela nigripes	black-footed ferret	Endangered	Associated with prairie dog colonies in grassland habitats. Not known to occur within region.
Myotis ciliolabrum	small-footed myotis	SOC	Roosts in caves, crevices, and man-made structures. Associated with pine forest habitats. A maternity colony occurs on Holloman AFB.
Myotis evotis	long-eared myotis	SOC	Associated with forest habitats. Roosts in trees, caves, and man-made structures.
Myotis lucifugus occult	occult little brown bat		Forages over water bodies. Roosts in caves, crevices, and man-made structures. Hibernates during cold weather.
Myotis thysanodes	fringed myotis	SOC	Associated with juniper and mountain habitats (e.g., Chinati and Guadalupe Mountains). Have been found in colonies.
Myotis velifera	cave myotis	SOC	Colonial, cave-dwelling bat species. Uses man-made structures. Broadly distributed. Insectivorous.
Myotis volans	long-legged myotis	SOC	Associated with ponderosa pine and woodland (e.g., oak) habitats. Insectivorous.
Myotis yumanensis	Yuma myotis	SOC	Associated mainly with desert habitats. Insectivorous. Frequent along the Rio Grande River.
Neotoma micropus leucophaea	White Sands woodrat	SOC	Associated with desert shrub vegetation throughout western Texas and New Mexico. Feeds on cacti (e.g., sotol, prickly pear, agave) and woody plants (mesquite, acorns). Subspecies not found on Holloman AFB during 1994 and 1995 surveys.
Nyctinomops macrotis	big free-tailed bat	NM Threatened, SOC	Broadly distributed in western North America and in South America. Maternal colonies found in mountain areas (e.g., Chisos Mountains, Guadalupe Mountains). Observed on Holloman AFB. Insectivorous.

Table 3.5-4. List of Protected and Sensitive Species Known or Potentially Present Within the ROI (continued)

Scientific Name	Common Name	Status[1]	Comments
Ovis canadensis mexicana	desert bighorn sheep	NM Endangered	Desert bighorn sheep historically occurred in 16 areas in NM, now reduced to 5 areas, with less than 130 animals statewide (Heft, 1997; NMDGF , 1997). San Andres population estimates were 270 in 1967; 200 in 1976; less than 35 in 1984; currently less than 10 animals remain. (Weisenberger, 1997; Rominger, 1997; Heft, 1997). This population will probably be lost in the near future if it is not augmented. The crash is largely due to a scabies mite outbreak. Big Hatchet population estimates include 125-150 in the mid-1950s; 20 in the 1970s; supplemented with 14 sheep in 1978; supplemented with 18 sheep in 1982; supplemented with 6 rams in 1997 (NMDGF, 1998); currently about 60 animals. This herd has declined due to many factors including drought. The Peloncillo population was reintroduced with 30 sheep in 1980 and 24 additional sheep were released in 1997 (hunted herd with 2 permits allocated each year) (NMDGF, 1998). This population remains low; its decline has been associated with habitat loss, livestock competition, predation, disease and human disturbance (NMDGF , 1997). There is a fourth population known from the Sevilleta NWR. This herd is known to occur from Ladron Mts. to "M" mountain. The fall 1996 survey indicated that there were 32 individuals in this herd. An additional 8 rams were released in 1997 (NMDGF, 1997). This population is thought to be relatively stable, with the biggest threat coming from mountain lion predation (Heft, 1997). Less than 10 bighorn were released in the Fra Cristobal Mts. in November 1997. Seven bighorn (*Ovis canadensis nelsoni*) have been introduced into west Texas (Sierra Diablo, Chinati, and Elephant Mountains). Population is small (over 300) and closely managed.
Ondatra zibethicus ripens	Pecos River muskrat	SOC	Associated with river systems including the Pecos and Rio Grande Rivers. Habitat not present on McGregor Range.
Plecotus townsendii pallescens	pale Townsend's big-eared bat	SOC	Associated with habitats ranging from desert shrub to fir forest types. Potential habitat present on McGregor Range. Known to occur in Jornado Caves and other locations.
Tamias canipes	gray-footed chipmunk	SOC	Associated with forest and woodland habitat. Found in Guadalupe, Sierra Diablo, and Sacramento Mountains.
Tamias minimus atristriatus	Penasco least chipmunk	NM Endangered	Trapped in Sacramento Mountains in early 1990s.
Thomomys umbrinus guadalupensis	Guadalupe Southern pocket gopher	SOC	Associated with mountain habitats.
Ursus americanus	black bear	TX Endangered	Primarily found in remote mountainous areas.
Vulpes velox	swift fox	U.S. Candidate	Associated with shortgrass prairie habitat north of proposed action area.
Zapus hudsonius luteus	New Mexican jumping mouse	SOC	Associated with moist/wet grasslands. Individuals have been observed and live-trapped in Lincoln NF since 1989.

1 Status includes Federal (U.S.) and State status. Parenthetical annotation indicates which state the species may be present within the Region of Influence.
Federal Endangered - Species in danger of becoming extinct throughout all or a significant portion of their range.
Federal Threatened - Species likely to become endangered in the foreseeable future.
Proposed - Species that are the subject of a proposed rule for listing.
Candidate - Species considered by USFWS for listing as endangered or threatened, but are not yet the subject of a proposed rule for listing.

2 Plants included on the list are those potentially present where ground-disturbing activities may occur (Holloman AFB, McGregor Range, Oscura and Red Rio impact areas, and Melrose Range).

3 SOC = USFWS Species of Concern. Species formerly identified by USFWS as Category 2 candidate species are still considered to be of concern to USFWS.

Oscura Impact Area. No jurisdictional wetlands are present within the primary impact area but may be present within intermittent streams in the safety area of the Oscura impact area. Waters of the U.S. were identified as potentially occurring within the safety area; two intermittent streams within the primary impact area were also identified as Waters of the U.S. (Wareing, 1997).

Red Rio Impact Area. No jurisdictional wetlands are located on the Red Rio impact area. Waters of the U.S. were identified as potentially occurring within the safety area and may be present within portions of the primary impact area. This is based on unpublished data collected in 1995 (Wareing, 1997).

West Otero Mesa NTC Site. No jurisdictional or nonjurisdictional wetlands are known to exist within the West Otero Mesa site; however, Waters of the U.S. were delineated as potentially occurring in the southern and northern portions of the site (USACE, 1997). This determination is preliminary, based on partial field surveys and requires final determination by the Corps of Engineers district engineer. Similarly, no wetlands were observed during a March 1997 field survey . There are, however, nearly 46,000 linear feet of drainages which could potentially be Waters of the U.S. located within the West Otero Mesa site (USACE, 1997). These waters are in normally dry drainages in the northeast and west ends of the site. They form a broad swale dominated by grama grass, as is the surrounding uplands; there is no gravel channel. The density of yucca and cholla is noticeably higher in the swale compared to the uplands. Topographic relief is much greater in the northeast area compared to the west area of the site. The northeast area is shrub-dominated (e.g., creosotebush and little-leaf sumac), whereas the west area is more grass-dominated.

Tularosa Basin NTC Site. No jurisdictional wetlands are known to occur on the Tularosa Basin site based on a March 1997 field survey, although jurisdictional Waters of the U.S. are potentially present (USACE, 1997). One group of earthen ponds (tanks) is located within the Tularosa Basin site and two other tanks are within 1.5 miles of the site. Potential Waters of the U.S., covering about 33,240 linear feet, are found within the Little Mack Tank and Middle Tank arroyos and include the earthen ponds (Little Mack, Mack, and Middle Tanks). These waters are in normally dry drainages in the south and north ends of the site.

Little Mack Tank is within the boundary of the Tularosa Basin site. This tank was dry when visited in March 1997 and was determined not to have the vegetation, soil, or hydrological characteristics to meet the definition of a jurisdictional wetland. The tank consists of an oblong area of bare ground (about 190 by 220 feet). A berm on the north, south, and west sides had a dense growth of vegetation, with mesquite being the most common shrub. Other shrubs observed were creosotebush and little-leaf sumac. The mesquite and creosotebush growing on the berm were much taller than in the surrounding desert. Bunchgrass species are also common on this berm and form a dense growth 35 feet wide at the east end of the tank. A dense stand of little-leaf sumac is present beyond the eastern grass area.

The Mack Tanks are about 1.5 miles southeast of the boundary of the Tularosa Basin site. There are two earthen ponds (tanks) at Mack Tanks and the eastern tank

contained a pool of standing water that was about 35 by 55 feet in size with no vegetation surrounding the water. This tank is used by wildlife, as evidenced by the numerous tracks surrounding the tank and the two mule deer observed during a field visit. This tank contains water year-round (Offut, 1997). Grass-dominated vegetation occurs on flat areas about three feet above the east tank. A small (65 by 125 feet) stand of willows (*Salix* spp.) is downgradient to the east and may be regulated by water runoff from the east tank. No water was present on the surface near the willows during a March 1997 field survey of the site. Also, salt cedar (*Tamarix* spp.) and dead cottonwoods (*Populus* spp.) surround the east tank, and 30 to 50 birds of various species have been observed, including Cooper's hawk. The west pond was dry and the ground was mostly bare. This area had a radius of about 50 feet and may also have been a wetland. There is a circular growth of plants in the lowest-lying area, including cocklebur, spikerush, and other grass species.

Middle Tank is about one mile west of the Tularosa Basin site boundary. This tank is similar to Little Mack Tank with an oblong area of bare ground (210 by 200 feet) surrounded by a berm on the north, south, and west sides. Vegetation on the berms is similar to Little Mack Tank. There are three willow trees in the middle of the bare ground. Adventitious roots were observed 12 to 15 inches above the ground during a March 1997 field survey, indicating that standing water has occurred in this pond.

3.6 ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES

This section characterizes archaeological, cultural, and historical resources within the area potentially affected by the proposed action. Such resources are composed of prehistoric or historic districts, sites, buildings, structures, objects or, other evidence of human use important to a culture, subculture, or community for scientific, traditional, religious, historical, or other reasons. These resources can be grouped into four major categories: prehistoric archaeological resources, historic archaeological resources, architectural resources, and traditional cultural properties. For all practical purposes, no change in these resources would be expected between FY95 and FY00. As a result, the following description applies equally to both periods.

Federal law protects cultural resources determined to be significant. Significant resources are generally those that are eligible for a listing on the National Register of Historic Places (National Register) (36 CFR 60.4), or that are important to Native American or other traditional groups. Most cultural resources are evaluated through the Section 106 process of the National Historic Preservation Act (NHPA).

To be considered significant, and hence eligible for a listing on the National Register, archaeological and architectural properties must meet one or more of the criteria outlined in 36 CFR 60.4. The National Register eligibility status of a number of the archaeological sites located during the inventory at the West Otero Mesa and Tularosa Basin training option areas is described in this document as "undetermined." Further investigation of these cultural resources is necessary to provide an adequate basis for evaluation using National Register criteria. As part of

the Section 106 process, the National Register eligibility of these sites would be determined prior to implementation of the proposed action. It is likely that some of these "undetermined" archaeological sites would be determined eligible and some would be determined not eligible. In general, buildings must also be at least 50 years old to be eligible for listing on the National Register. The importance of sacred sites, traditional use areas, and other traditional cultural properties is addressed in the 1992 Amendments to the NHPA, Executive Order 13007, and Advisory Council on Historic Preservation (ACHP) guidelines, and can be assessed through consultation with affected Native American groups. Traditional cultural properties are those that are culturally important to Native Americans, and can potentially include sacred geographic locations, archaeological sites, wildlife habitat, hunting and plant gathering areas, and natural features. Even if traditional cultural properties do not fulfill the criteria for National Register eligibility under 36 CFR 60.4, they may still be of significance to Native American groups.

A recent development in historic preservation is the concept of rural historic landscapes. A historic landscape is "a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, road and waterways, and natural features" (McClelland and Keller, 1995).

The concept of historic landscapes stems from an acknowledgment that the interpretation of important physical traces of history, such as ranch buildings, is enhanced by placing them in a larger context, or landscape. "Landscape interpretation is the process of providing the visitor with tools to engage in an experience of the landscape as it existed during its period of significance or as it has evolved to the present" (O'Donnell, 1994). Historic landscapes must be evaluated for National Register eligibility like any other historic resource. The landscape's integrity, particularly as it relates to historic vegetation and land use, must also be considered.

3.6.1 Cultural Context of the Affected Area

Paleo-Indian Period (approximately 10,000 BC - 6000 BC). The cultural chronology of the region, including the Tularosa Basin, stretches back to the Paleo-Indian period, although sites this old are rare. Paleo-Indian groups were highly mobile hunter-gatherers focusing on large game animals. Occasional Paleo-Indian projectile points have been recovered in the Tularosa Basin and from Otero Mesa on McGregor Range (Peter and Mbutu, 1995).

Archaic Period (6000 BC - AD 200). With the gradual disappearance of larger game animals, prehistoric groups shifted their attention to smaller game such as bison, deer, and antelope. Archaic assemblages are common in the region, although many are dated solely based on the presence of "diagnostic" projectile points or the absence of pottery. The true nature, extent, and time depth of Archaic use of the area remains unclear.

Formative Period (AD 200 - AD 1492). The Formative period is characterized by the introduction of ceramics and a shift from mobile hunting-gathering to a more sedentary subsistence base, including the adoption of agriculture. In later phases, pueblos were established along the Rio Grande and at a few locations within the Hueco Bolson and Tularosa Basin. A shift from the use of ceramics manufactured elsewhere to locally produced pottery also occurred.

Overall, the prehistoric archaeology of the Tularosa Basin is diverse, with small, general-purpose sites, plant processing areas, rock middens, pueblos, specialized lithic procurement sites, and rock art sites. Prehistoric human burials have rarely been located, and caches and rock alignments are uncommon.

Historic Period (AD 1492 - Present). The Historic Period begins with the landfall of Columbus in the New World in 1492 and extends to the present. The region of New Mexico and west Texas was first visited by Europeans in 1528. Expansion into these northern reaches of New Spain was motivated by mining, ranching, conscription of labor, and missionary activity. The first permanent settlements in New Mexico date to 1598. In 1682, shortly after the Pueblo Revolt, a mission and presidio were established at El Paso del Norte for the Suma and other tribes. The reconquest of the Pueblos was completed in 1692 and soon there were Spanish settlements along the Rio Grande north of El Paso.

The Spanish signed a treaty with the Mescalero Apache in 1810 that granted the Tribe lands from El Paso north to the Sacramento Mountains. Mexico achieved independence from Spain in 1821, and the treaty was reaffirmed by the Mexican government in 1832.

The Texas Revolution began in 1835. The Republic of Texas lasted until 1845 when Texas entered the union. In 1846, war between the U.S. and Mexico broke out and Mexico was defeated. Most of New Mexico and Arizona were then ceded to the U.S. Since 1836, Texas had claimed all of the Mexican lands east and north of the Rio Grande, an area that included much of what is now New Mexico. However, the European population along the Rio Grande at that time was primarily Hispanic and they had few ties to the Anglo-American settlements in East Texas. Finally, in 1850 it was agreed that Texas would have its present boundaries and that New Mexicans could organize their own territory.

Historic settlement in the vicinity of McGregor Range began with the founding of Tularosa in 1862. One of the most prominent settlers of the area, Oliver Lee, established a ranch along the edge of the Sacramento Mountains in 1886 (Faunce, 1997). Lee's efforts at bringing Sacramento water down into the Tularosa Basin via either pipeline or ditch allowed his ranching operations to survive the dry years of the 1890s. Lee's holdings were extensive, and he later sold the land in which Alamogordo was founded. Tularosa and other smaller villages in the area were subjected to harassment and raids by Mescalero Apaches until the Apache were defeated in the Battle of Round Mountain in 1868. In 1873, a reservation for the Mescalero was established on the eastern slopes of the White and Sacramento

mountains, 30 miles northeast of Alamogordo. The Mescalero Apache Reservation currently covers over 460,000 acres and has 2,750 residents.

Spanish and Mexican haciendas had existed along the Rio Grande for many years, but the extensive Texas cattle industry of the 19th century took some time to develop. With the threat of Indian raids gone, cattle ranchers moved into the area and by the 1880s, portions of the Tularosa Basin were already overgrazed. With the anticipated arrival of the railroad, the town of Alamogordo was founded in 1898, followed shortly thereafter by the creation of Otero County.

Holloman AFB. Holloman AFB was originally established in 1942 as Alamogordo Army Air Field, with a mission of providing training for British Royal Air Force (RAF) aircrews, although the RAF never actually used the base (Ernst et al., 1996). During World War II, the base was a site for the training of B-17, B-24, and (later) B-29 bomber crews. Originally designed to RAF specifications, the base had a triangular runway design and a three-part cantonment area. Following the war's end, the base was deactivated in February 1946, and reactivated one month later as a missile testing and development center. In 1947, with the formal establishment of the U.S. Air Force, the base's name was changed to Alamogordo AFB and finally to Holloman AFB in early 1948. Holloman AFB, WSMR, and McGregor Range (operated by Fort Bliss) soon became a national center for missile development and training. In 1971, Holloman AFB became part of Tactical Air Command and shifted from missile testing to fighter pilot training. In 1992, Holloman AFB became part of ACC.

McGregor Range. U.S. Army use of McGregor Range began in 1948, when 204,000 acres were leased under a co-use arrangement with the McGregor family. This was followed by a five-year lease agreement with the McGregor family and other ranchers for exclusive use of the land by the Army. In 1950, the Army bought the Andrew Davis Ranch to expand the land available for training and testing of missile systems. Faced with expiring leases and additional needs, the Army in 1954 decided to purchase 700,000 acres, including the previously leased lands. The McGregor Guided Missile Range was created in early 1957 (Lowry and Henry, 1997). Its main use initially was for training and for testing the Nike missile system. It was later used for the Nike-Ajax, Nike-Hercules, HAWK, Redeye, Pershing, and PATRIOT systems.

3.6.2 Site-Specific Resources

The following presents a description of archaeological, cultural, and historical resources in areas potentially affected by implementation of the proposed action.

Holloman AFB. No prehistoric cultural resources have been identified within the cantonment area or existing munitions storage area of Holloman AFB (Tagg, 1996). It is unlikely that any prehistoric cultural resources will be discovered in these areas in the future because of the extent of previous construction and disturbance. The proposed 15-acre expansion south of the munitions storage area was surveyed in 1997 and one archaeological resource was identified. Its National Register eligibility

is undetermined (Tagg, 1997). Prehistoric cultural resources have been recorded elsewhere within Holloman AFB, but outside the cantonment area. These resources consist of surface and subsurface artifacts and features dating back to the Paleo-Indian period. A detailed description of these cultural resources is not provided in this EIS because no construction activities are proposed for any area outside the cantonment area or existing munitions storage area other than in the munitions storage area expansion as discussed above.

Similarly, no historic archaeological resources have been identified within the cantonment area, munitions storage area, or proposed munitions storage area expansion. Historic archaeological resources do occur elsewhere on the base, and consist of the collapsed remains of ranch buildings and scatters of refuse (Hawthorne, 1994). Again, no construction activities are proposed for any area outside the cantonment area or existing munitions storage area other than in the munitions storage area expansion as discussed above.

Holloman AFB contains over 100 buildings (not including housing) dating from 1943 to 1968. National Register evaluation for some of these buildings is planned (Tagg, 1996). Three buildings that would be directly affected by construction related to the proposed action have been previously evaluated for National Register eligibility (Ernst et al., 1996). These are Building 107 (an academic classroom constructed in 1943); Building 289 (a small storage building constructed in 1943); and Building 291 (a hangar constructed in 1943). Buildings 107 and 291 have been determined not eligible for listing on the National Register. Building 289 was judged to be potentially eligible. The New Mexico SHPO concurred with these determinations. Building 289 has been documented under the NPS Historic American Building Survey/Historic American Engineering Record (HABS/HAER) guidelines; no additional measures are required under the Section 106 process to document this building prior to demolition. No other potentially significant historic buildings on Holloman AFB would be affected by the proposed action.

No traditional cultural properties have been identified on Holloman AFB by Native American groups with historic ties to the region (i.e., the Mescalero Apache and the Tigua). Holloman AFB has communicated with the Mescalero Apache in the past regarding concerns they might have about Air Force activities and cultural resources, but no concerns were expressed (Tagg, 1997b). Holloman AFB has initiated government-to-government communication with the Mescalero Apache addressing potential impacts of the proposed action on cultural resources, including traditional cultural properties (see Appendix F). Holloman AFB has also given a formal presentation to the Tribe on the proposal.

According to Fort Bliss cultural resources personnel (Bowman, 1997), the Tigua have previously expressed interest only in projects in the southern portions of Fort Bliss and not in the New Mexico portions. Holloman AFB is located north of the area of concern for the Tigua. Therefore, based on previous communication with the Tigua and Mescalero Apache, it is anticipated that no traditional cultural properties will be identified on Holloman AFB. If a Native American group notifies Holloman AFB of concerns, follow-up discussions will be held.

West Otero Mesa NTC Area. In 1997, an intensive, systematic cultural resources inventory of the entire West Otero Mesa NTC area, covering a total of 5,785 acres, identified 22 archaeological sites. Ages ranged from possible Paleo-Indian to mid-20th century. The resources included prehistoric archaeological sites; Native American sites of unknown age; a historic pipeline; and one historic site with a Native American component of unknown age. No architectural resources were found during the inventory. Nine sites have been determined eligible to for listing on National Register or have undetermined eligibility, and 13 are not eligible. However, these determinations of eligibility have not yet been reviewed by the New Mexico SHPO. The review by the New Mexico SHPO will be completed after submission of the final cultural resources technical report, which is nearing completion. Under the Section 106 process, Fort Bliss will submit determinations of eligibility to the SHPO, who will concur within 30 days, concur with modification, or not concur. If the SHPO does not agree with determinations of eligibility for specific sites, Fort Bliss can seek formal determinations of eligibility from the Keeper of the National Register.

No traditional cultural properties have been identified within the West Otero Mesa NTC area by the Mescalero Apache or the Tigua. As mentioned above, Holloman AFB has initiated government-to-government communication with the Mescalero Apache, who have expressed interest in the proposed placement of the NTC. Mescalero representatives have also expressed concerns about Apache archaeological sites, a spring, an Apachean trail, and traditional plant gathering areas, although these were not specifically identified as being within the West Otero Mesa NTC area.

According to Fort Bliss cultural resources personnel (Bowman, 1997), the Tigua have previously expressed interest only in projects in the southern portions of Fort Bliss and not in the New Mexico portions. The West Otero Mesa NTC area would be located north of the area of concern for the Tigua. If the Mescalero Apache or Tigua identify traditional cultural properties in this location, additional discussions will be pursued.

Tularosa Basin NTC Area. In 1997, an intensive, systematic cultural resources inventory of the entire Tularosa Basin NTC area covering a total of 6,645 acres, identified 46 archaeological sites. Ages ranged from Paleo-Indian to mid-20th century. These resources included prehistoric archaeological sites; Native American sites of unknown age; a historic water control feature (Little Mack Tank); and another historic water control feature with a prehistoric component. No architectural resources were found during the inventory. Twenty-one sites are eligible for listing on the National Register or undetermined, and 25 sites are not eligible. However, these determinations of eligibility have not yet been reviewed by the New Mexico SHPO. The review by the New Mexico SHPO will occur after submission of the final cultural resources technical report by Fort Bliss, as discussed above.

No traditional cultural properties have been identified in the Tularosa Basin NTC area by either the Mescalero Apache or the Tigua, although Mescalero

representatives have expressed general concerns about Apache archaeological sites, a spring, a trail, and plant gathering areas. These resources were not specifically identified as occurring within the Tularosa Basin NTC area. Mescalero representatives have expressed interest in locating and, if available, gathering medicinal plants on Fort Bliss. As mentioned previously, Holloman AFB has initiated government-to-government communication with the Mescalero Apache.

The Tigua have expressed interest only in projects in the southern part of Fort Bliss and not in New Mexico. The Tularosa Basin NTC area is located north of the area likely to be of concern to the Tigua. If the Tigua or Mescalero Apache identify traditional cultural properties in the area, additional discussion will be held.

Existing Impact Areas. All lands within the firebreak roads at Red Rio and Oscura impact areas have been surveyed for cultural resources. Cultural resources were identified at Red Rio, and some had been impacted by previous use of the target areas. Data recovery excavations have been conducted at four significant cultural resources at Red Rio to mitigate impacts under Section 106 of the NHPA. As part of the impact analysis process, the U.S. Air Force is conducting a cultural resources survey for a proposed fiber-optic line that would be buried at Red Rio. The survey is not yet complete, but previous investigations suggest that cultural resources exist in the vicinity of the affected area (Giese, 1998; Wareing, 1998). Very few cultural resources were found during the Oscura survey, and none of the sites within the firebreak road have been excavated. The target area on Melrose Range has also been inventoried, but no significant cultural resources were identified (Crowe, 1997b).

Affected Airspace. Archaeological, cultural, and historical resources underlying the affected airspace (MTRs, MOAs, and Restricted Areas) are considered in less detail than resources in areas of potential ground disturbance because it is unlikely that aircraft overflight would adversely affect most of them. Only those resources potentially affected by vibration, noise, or visual impacts are of concern. These resource types possibly include certain architectural resources and Native American traditional cultural properties (see Section 4.6.1.2). Most archaeological resources in the region are surface scatters of prehistoric or historic artifacts or buried deposits and have no potential for damage from aircraft overflight. The proposed action includes limited supersonic flight above portions of WSMR; therefore, cultural resources on WSMR that might potentially be affected by sonic booms are considered.

Table 3.6-1 lists cultural resources underneath the affected airspace that are eligible for, or listed on, the National Register as of December 1997. In addition to these specific properties, some New Mexico and Texas parks, monuments, and special management areas located beneath the affected airspace also contain important cultural resources. These include the Gran Quivira, Abo, and Quarai units of Salinas Pueblo Missions National Monument; Gila Cliff Dwellings National Monument; White Sands National Monument; the Trinity Site, Launch Complex 33 National Historic Landmark, and the Eugene Rhoades gravesite (all located within WSMR); Three Rivers Petroglyph Recreation Area ACEC; Cornudas ACEC; and Alamo Mountain Petroglyph Area ACEC.

Table 3.6-1. National Register Properties under or near Affected Airspace

Apache County, Arizona	Butterfly Lodge (Greer) Colter Ranch Historic District (Eagar vicinity) Eagar School (Eagar) Eagar Townsite Historic District (Eagar) PS Knoll Lookout Complex (Maverick vicinity) Water Canyon Administrative Site (Springerville)
Greenlee County, Arizona	Bear Mountain Lookout Complex (Apache-Sitgreaves National Forest)
Catron County, New Mexico	Ake Site (Datil vicinity) Bearwallow Mountain Lookout Cabins and Shed (Bearwallow Park) Black Mountain Lookout Cabin (Black Mountain) El Caso Lookout Complex (El Caso Lake) Gila Cliff Dwellings National Monument (Silver City vicinity) Mangas Mountain Lookout Complex (Mangas vicinity) Mogollon Baldy Lookout Cabin (Mogollon Baldy Peak) Mogollon Historic District (Mogollon) Mogollon Pueblo (Red Hill vicinity) Socorro Mines Mining Company Mill, Fannie Hill (Mogollon vicinity)
Chaves County, New Mexico	Site LA-11809 to LA-11822 Archaeological Site LA-27573 Rio Feliz Bridge
Eddy County, New Mexico	Site H130-6-190 (Carlsbad area) Site AR30-6-1034 (Carlsbad area) Maroon Cliffs Archaeological District (Carlsbad area) Archaeological Site LA-18161 (Carlsbad area) Carlsbad Reclamation Project (Carlsbad) Caverns, The Historic District (Carlsbad) Dam - Sitting Bull Falls Recreation Area (Carlsbad area) First National Bank of Eddy (Carlsbad) Group Picnic Shelter - Sitting Bull Falls Recreation Area (Carlsbad area) Painted Grotto (Carlsbad area) Picnic Shelter - Sitting Bull Falls (Carlsbad area) Rattlesnake Springs Historic District (Carlsbad area)
De Baca County, New Mexico	De Baca County Courthouse (Fort Sumner) Fort Sumner Railroad Bridge (Fort Sumner vicinity) Fort Sumner Ruins (Fort Sumner)
Guadalupe County, New Mexico	Abandoned Route 66 - Cuervo to NM 156 (Cuervo vicinity) Anton Chico de Abajo Historic District (Anton Chico vicinity) Jesus M. Casaus House (Santa Rosa) Colonias de San Jose Historic District (Colonias vicinity) Alexander Grzelachowski House and Store (Puerto de Luna) Guadalupe County Courthouse (Santa Rosa) La Placita De Abajo District (Colonias vicinity) Las Esteros Lake Archaeological Site Julius J. Moise House (Santa Rosa)

Table 3.6-1. National Register Properties under or near Affected Airspace (continued)

Otero County, New Mexico	Fairchild Site (White Sands National Monument) Fairchild Archaeological Site (Alamogordo) Dog Canyon Archaeological Site LA-15939 (Alamogordo area) Administration Building (Alamogordo) Archaeological Site No. AR-03-08-03-128 (Guadalupe Mtns) Auditorium and Recreation Building (Alamogordo) Bluewater Lookout Complex (Lincoln National Forest) Carrisa Lookout Complex (Lincoln National Forest) Central Receiving Building (Alamogordo) Circle Cross Ranch Headquarters (Sacramento) Infirmary Building (Alamogordo) Weed Lookout Tower (Sacramento area) White Sands National Monument Historic District (Alamogordo area) 31 Archaeological properties are within Otero County
Quay County, New Mexico	Baca-Goodman House (Tucumcari) Blue-Swallow Hotel (Tucumcari) Hurley Arch. Conservancy District Office (Tucumcari) Metropolitan Park Bathhouse and Pool (Tucumcari) Richardson Store (Montoya) Rock Island-Southern Pacific Passenger Depot (Tucumcari) State-maintained Route 66 (Montoya vicinity)
Roosevelt County, New Mexico	No National Register Properties under airspace
Socorro County, New Mexico	Trinity Site National Historic Landmark (White Sands Missile Range)
Valencia County, New Mexico	No National Register Properties under airspace
Brewster County, Texas	Archaeological Site 41BS41 Archaeological Site 41BS609 Brewster County Courthouse and Jail (Alpine) Burro Mesa Archaeological District (Panther Junction area) Castolon Historic District (Big Bend National Park) Daniels Farm House (Rio Grande village area) Hot Springs (Big Bend National Park) Luna Jacal (Big Bend National Park) Mariscal Mine (Big Bend National Park) Rancho Estelle (Big Bend National Park) Terlingua Historic District Wilson, Homer, Ranch (Santa Elena junction area)

Table 3.6-1. National Register Properties under or near Affected Airspace (continued)

Culberson County, Texas	Emigrant Trail to California & Butterfield Stage Route (Guadalupe Mtns. Natl. Park) Three-mile/Sulfur Archaeological District (Van Horn) Clark Hotel (Van Horn) First Presbyterian Church (Van Horn) Granado Cave (Toyah area) Guadalupe Ranch (Salt Flat area) Lobo Valley Petroglyph Site (Lobo area) McKittrick Canyon Archaeological District (Guadalupe Mtns. National Park) Pinery Station (Guadalupe Mtns. National Park) Pratt, Wallace, Lodge (Guadalupe Mtns. National Park)
Hudspeth County, Texas	Alamo Canyon-Wilkey Ranch Discontiguous Archaeological District (Ft. Hancock area) Hudspeth County Courthouse (Sierra Blanca) Indian Hot Springs Health Resort Historic District (Sierra Blanca area) Johnson, Rod, Site (Sierra Blanca area) Red Rock Archaeological Complex (Allamoore area) Tinaja de las Palmas Battle Site (Sierra Blanca area) In addition, there are 81 archaeological properties in the Sierra Blanca area
Jeff Davis County, Texas	Fort Davis National Historic Site (Fort Davis) Grierson-Sproul House (Fort Davis) Phantom Lake Spring Site (Toyahuale area) Trueheart, Henry M. and Annie V., house
Pecos County, Texas	Canon Ranch Railroad Eclipse Windmill (Sheffield area) Canon Ranch Archaeological District (Sheffield area) Fort Stockton Historic District (Fort Stockton)
Presidio County, Texas	Archaeological Site 41PS109 El Fortin del Cibolo Historic District (Shafter area) El Paisano Hotel (Marfa) Fort Leaton (Presidio area) Fortin de la Cienega (Shafter area) La Junta de los Rios Archaeological District (Presidio area) La Morita Historic District (Shafter area) Presidio County Courthouse (Marfa) Shafter Historic Mining District (Shafter) Tapalcomes (Redford area)

Much of the area under the affected airspace is within the traditional territory of the Mescalero Apache, although only a small portion of the current reservation is under affected airspace. Several classes of natural features, including caves, springs, and certain mountain peaks, have spiritual significance to the Mescalero Apache. Carmichael (1994) identifies four primary sacred mountain peaks in southern New Mexico: Guadalupe, Salinas, Capitan, and San Augustin. Of these, Capitan underlies VR-100/125, while Salinas and San Augustin underlie R-5107B. Guadalupe Peak does not underlie affected airspace. However, no concerns have been expressed previously by the Mescalero Apache regarding potential impacts to traditional cultural properties underneath the airspace. Government-to-government communication addressing potential impacts to traditional cultural properties associated with the project has been initiated by Holloman AFB. Holloman AFB has held a meeting with the Mescalero in which various topics were discussed, including flights over the Reservation. However, these concerns about overflights did not specifically mention cultural resources.

The U.S. Air Force is in the process of consulting with tribes who live underneath the affected airspace to learn of their concerns and comments about the proposed action. In addition to the Mescalero, these groups include the Ramah Navajo Reservation, Alamo Navajo Reservation, Pueblo of Acoma, Pueblo of Laguna, and Pueblo of Zuni.

3.7 WATER RESOURCES

This section describes surface and groundwater resources in the area potentially affected by earth-disturbing activities associated with the proposed action. The ROI includes those areas which would experience earth disturbance due to construction or changes in munitions delivery. These areas include Holloman AFB and vicinity, the West Otero Mesa and Tularosa Basin NTC training option sites, the Oscura and Red Rio impact areas, and Melrose Range. A discussion of existing conditions in these areas is provided in Section 3.7.1. A discussion of likely changes in these conditions that would result from water use in the near future is presented in Section 3.7.2. Consideration of matters relating to water supply and use is presented in Section 3.11 (Utilities).

3.7.1 FY95 Conditions

3.7.1.1 Surface Water Resources

Per the New Mexico State Engineer Office, Interstate Stream Commission, 1996 Annual Report, the principal surface water drainages of the region include the Rio Grande Basin, Pecos River Basin, Estancia Basin, Jornada del Muerto Basin, Tularosa Basin, and Salt Basin. The Estancia, Jornada del Muerto, Tularosa, and Salt Basins are collectively identified as the Central Closed Basins. They comprise over 14,700 square miles of south-central New Mexico.

Most project-related activities of interest for surface water resources are located within the Tularosa Basin (Figures 3.7-1 and 3.7-2; note that the Tularosa Basin in Figure 3.7-1 is designated as item 4-3 in Figure 3.7-2). A corresponding index of regional surface water drainages and ground area extent is provided in Table 3.7-1. Areas of interest within the Tularosa Basin include Holloman AFB and vicinity, the Tularosa Basin NTC site, and Oscura and Red Rio impact areas. The West Otero Mesa NTC site is located within the Sacramento River watershed, which is part of the Salt Basin (Figure 3.7-1 and item 4-4 in Figure 3.7-2). Melrose Range is primarily located within the Pecos Basin (Figure 3.7-1 and item 3-1 in Figure 3.7-2), though portions of this range are tributary to the Canadian and Dry Cimmaron Basins.

Tularosa Basin. The Tularosa Basin comprises a 6,500 square-mile area within south-central New Mexico (see Figure 3.7-1 and item 4-3 in Figure 3.7-2). This feature is an arcuate, down-faulted basin that extends northward approximately 170 miles from near the New Mexico-Texas state line (Orr and Meyers, 1986). It is bounded on the east by the Sacramento Mountains and Sierra Blanca Peak, and on the west by the Franklin, Organ, and San Andres Mountains. Chupadera Mesa forms the northern basin boundary. A gentle topographic rise separates the Tularosa Basin from the Hueco Bolson to the south (Orr and Meyers, 1986).

The climate of the Tularosa Basin is arid to semi-arid desert characterized by abundant sunshine throughout the year, low humidity, an average annual rainfall of about 8.5 inches, and a high evaporation rate. The average annual evaporation, as measured by a U.S. Weather Bureau Class A evaporation pan (based on a four-year period), is 108.15 inches per year. The average annual precipitation, based on a 75-year record, is 8.65 inches (Knowles and Kennedy, 1956). The majority of precipitation is received as monsoonal rainfall, June through October, and does not exhibit the bimodal pattern common to the Chihuahuan and Sonoran deserts to the south and west. On a regional basis, precipitation increases markedly with increased elevation. Average precipitation figures from gauges in the Sacramento Mountains (near Cloudcroft) approach 20 inches. Average precipitation is 11.6 inches at Alamogordo, 10.1 inches at Orogrande, and 12.8 at Carrizozo.

Most precipitation entering the Tularosa Basin either infiltrates or evaporates, with less than three percent of precipitation reaching the saturated zone in the lower elevations. As a result, there are no permanently flowing rivers or streams in the study area. However, several watersheds have perennial stream segments where the water table is high. These perennial segments support important native wetlands communities. The Basin is characterized by small ephemeral washes and draws that carry water to lower elevations but (under normal flow conditions) do not discharge to a larger drainage. Key tributary watersheds in the Tularosa Basin include Salt Creek, Three Rivers, Rio Tularosa, and La Luz Creek, Malone Draw, and Lost River, which comprise separate segments of a single tributary system.

Most washes and draws are geographically distinct, but are not specifically identified on USGS topographic maps. These ephemeral drainages discharge to the central portion of the basin, where locally generated surface waters are contained and ponded. During periods of peak flow, small ephemeral lakes (playas) develop in

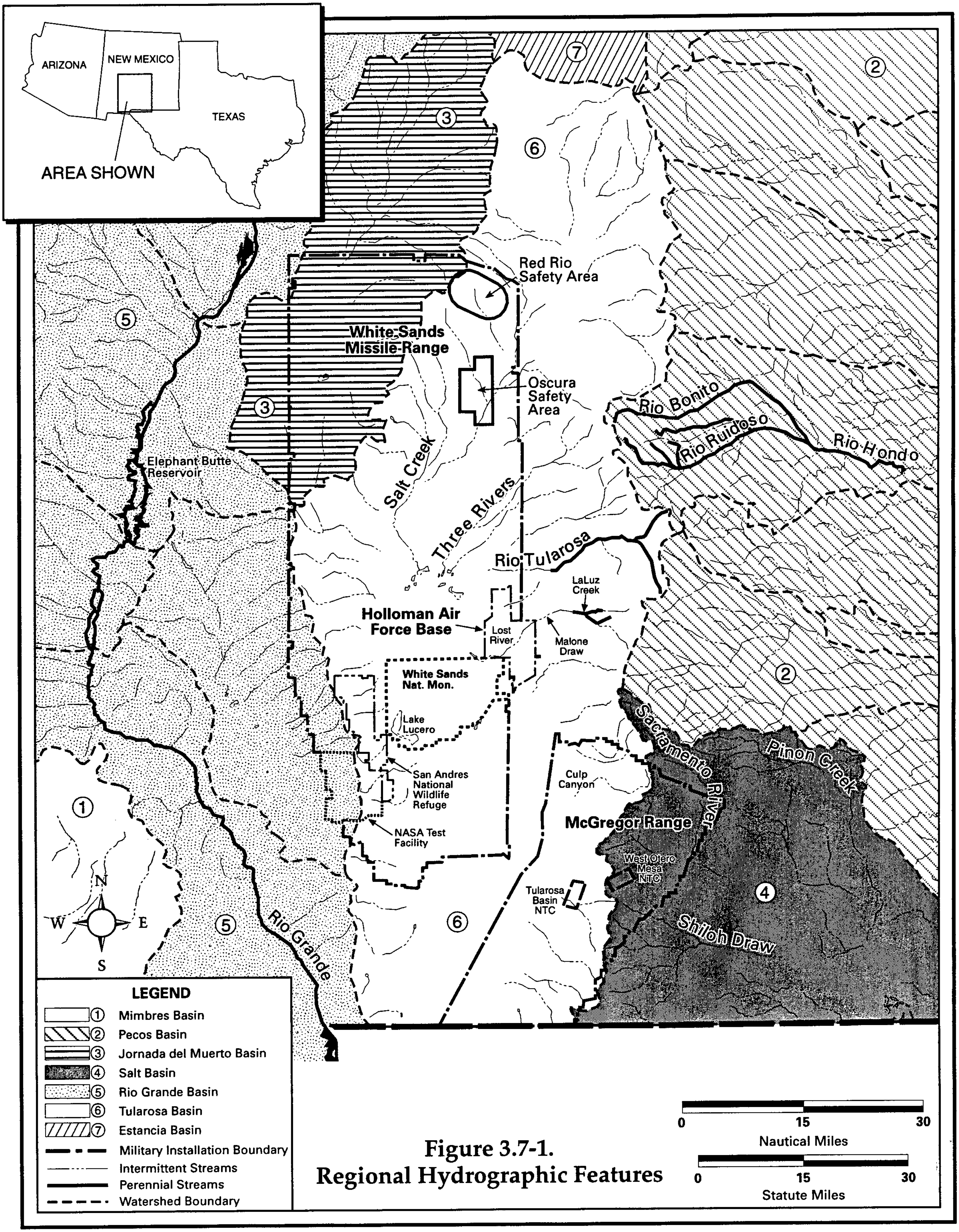

Figure 3.7-1.
Regional Hydrographic Features

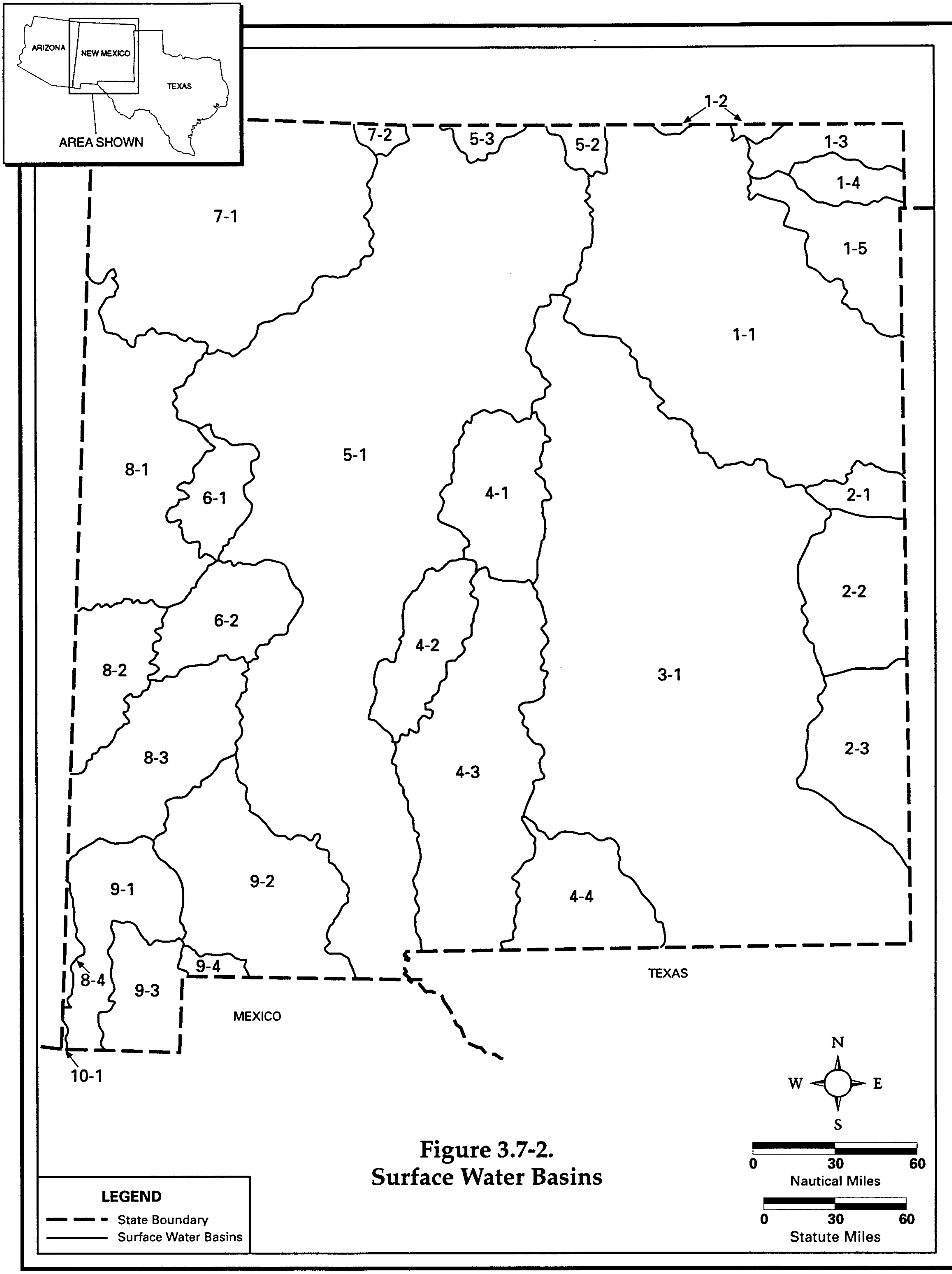

Figure 3.7-2.
Surface Water Basins

Table 3.7-1. Surface Water Drainage Basins

Basin	Square Miles	Basin	Square Miles
Arkansas River Basin	16,958	**Western Closed Basins**	2,686
1-1 Canadian River	12,885	6-1 North Plains	697
1-2 Purgatoire River	132	6-2 San Agustin Plains	1,989
1-3 Dry Cimarron River	1,000		
1-4 North Canadian River	736	**San Juan River Basin**	9,530
1-5 Carrizo Creek	2,205	7-1 San Juan River	9,276
		7-2 Navajo River	254
Southern High Plains	6,087		
2-1 Red River	678	**Lower Colorado River Basin**	10,950
2-2 Brazos River	2,727	8-1 Little Colorado River	5,325
2-3 Lea Plateau	2,682	8-2 San Francisco River	1,836
		8-3 Gila River	3,549
Pecos River Basin	25,962	8-4 San Simon	240
3-1 Pecos River	25,962		
		Southwestern Closed Basins	8,455
Central Closed Basins	14,707	9-1 Animas Basin	2,388
4-1 Estancia	2,239	9-2 Mimbres Basin	4,387
4-2 Jornada del Muerto	3,344	9-3 Playas Basin	1,390
4-3 Tularosa Basin	6,749	9-4 Wamel Basin	290
4-4 Salt Basin	2,375		
		Rio Yaqui Basin	36
Rio Grande Basin	26,295	10-1 Rio Yaqui	36
5-1 Rio Grande	25,731		
5-2 Costilla Creek	277		
5-3 Rio San Antonio	287		

Note: Designation numbers correspond to Figure 3.7-2.

low-lying regions. The most prominent playa is Lake Lucero, which, although a permanent basin feature, is an artifact of a much larger playa lake that occupies the lowest elevations of the Tularosa Basin during cooler climatic periods. Several other natural depressions and playas (specifically Lake Holloman and Stinky Playa) have been used for containment of sewage effluent and storm water runoff. Under current conditions, no significant volume of surface water is discharged from the Tularosa Basin.

Holloman AFB and its associated facilities are located on the east side of the Tularosa Basin and on the west flank of the Sacramento escarpment. Approximately two-thirds of McGregor Range is located in the Tularosa Basin, on the south flank of the Sacramento escarpment. Portions of McGregor Range at the Tularosa Basin NTC site drain westerly into the Tularosa Basin. As discussed in the Salt Basin subsection below, pipelines and associated water developments used by livestock and wildlife exist in the area of the proposed Tularosa Basin NTC. Within the safety area of the Tularosa NTC there are 12 earthen impoundments, two water storage tanks, and two water troughs with six miles of associated pipelines. There are no water developments within the NTC boundary.

The Red Rio and Oscura impact areas are located on the far northern flank of the Tularosa Basin, immediately south of Chupadera Mesa. The Oscura impact area is drained by several small watersheds tributary to Salt Creek. The Red Rio impact area is within a closed watershed. The watershed may be tributary to Salt Creek during periods of peak flow. While adjacent to a primary water area (Geo-Marine, 1996), the Red Canyon drainage is outside the surface drainage area of the LDT (U.S. Air Force, 1994c).

There are no perennial streams within the Red Rio target complex (Orr and Meyers, 1986). A small spring (Red Canyon Spring) is located approximately 6,000 feet south of the LDT. However, the associated stream is not considered perennial since during periods of low flow, the water percolates into the soil faster than the spring can charge the stream. As the spring is downgradient to the LDT, it presumably could receive water from that area (north and east). However, there is no direct route for surface water flow between Red Canyon Spring and the LDT. Red Canyon Spring is not designated as a wetland (U.S. Air Force, 1994c). As discussed in Section 3.7.1.2, Groundwater Resources, the strata underlying this area are generally impervious, as evidenced by the presence of the Red Canyon Spring.

Salt Basin. The Sacramento River is the most significant surface water feature in this basin and is the source of many water developments. Surface waters derived from Sacramento River (alternatively identified as Sacramento Creek) are captured and diverted to three pipelines passing through McGregor Range. Only one of these pipelines is relevant to the proposed expansion. The relevant pipeline (approximately 60 miles in length) diverts and delivers surface water from Sacramento River to the two proposed NTC areas. This pipeline delivers water to BLM grazing leases, including numerous water tanks, troughs, watering stations, and impoundments. Thus, water developments used for grazing livestock and wildlife are present on the McGregor Range in the areas associated with the NTCs.

The range contains 106 earthen impoundments, 24 water storage tanks, and 84 water troughs with associated pipelines. Several key sections of this pipeline pass through, or are immediately adjacent to, the West Otero Mesa NTC site. A pumphouse is within the NTC safety area and 100 yards outside the southwest corner of the proposed NTC. Within the safety area of the West Otero NTC there are 17 earthen impoundments, three water storage tanks, and 26 water troughs with 30 miles of associated pipeline. There are four miles of pipeline and three water troughs within the NTC boundary. The West Otero Mesa NTC site naturally drains to several small impoundments (stock tanks). These impoundments capture all local flow, with the exception of high-intensity storm events. Field investigations indicate that there is no significant discharge of surface water from the proposed NTC site to local waterways, and there is no indication of discharge to secondary or tertiary catchments except during low probability (catastrophic) storm events.

Pecos River Basin. Holloman AFB and Alamogordo own water rights in the Pecos watershed (Bonito Lake). Bonito Lake water is delivered through the Bonito pipeline to Alamagordo and then distributed to Holloman AFB and White Sands National Monument.

Melrose Range is drained by several small watersheds tributary to the Canadian, Dry Cimmaron, and Pecos river basins. There is no permanent surface water flow on or near Melrose Range. Although local draws extend into the major river valleys, they are only tributary during periods of unusually high rainfall (U.S. Air Force, 1995). Melrose Range is part of a large geographic zone commonly known as the Llano Estacado (or "Staked Plains"). This geographic area comprises a large portion of west Texas and eastern New Mexico. The topography on the Llano is characterized by flat, featureless terrain having almost no relief. The land surface elevation ranges from 4,300 to about 4,260 feet MSL. The land surface generally slopes to the east and southeast. The climate on Melrose Range is categorized as semi-arid. The average annual precipitation is about 15 inches, most of which occurs during summer thunderstorms. Winters are relatively dry, with an average annual snowfall of 13 inches (U.S. Air Force, 1995).

3.7.1.2 Groundwater Resources

Per the New Mexico State Engineer Office, Interstate Stream Commission, 1996 Annual Report, the declared groundwater basins in the general region include the Rio Grande (item 14 in Figure 3.7-3), Lower Rio Grande (item 28 in Figure 3.7-3), Hueco (item 29 in Figure 3.7-3), Tularosa (item 30 in Figure 3.7-3), Hondo (item 10 in Figure 3.7-3), and Penasco (item 11 in Figure 3.7-3). A corresponding index of regional groundwater basins and ground area extent is provided in Table 3.7-2. Of these, the Tularosa, Hondo, and Penasco groundwater basins along with the High Plains (or Ogallala groundwater basin) Aquifer are relevant to the proposed GAF expansion. In addition, the groundwater resources under the surface water Salt Basin (including the Sacramento River Basin and Otero Mesa), which are above an undeclared groundwater basin (item UD to the left of item 6 in Figure 3.7-3), are also relevant to the expansion. Administratively, an undeclared basin means that the State of New Mexico has not recognized a significant groundwater issue in the area.

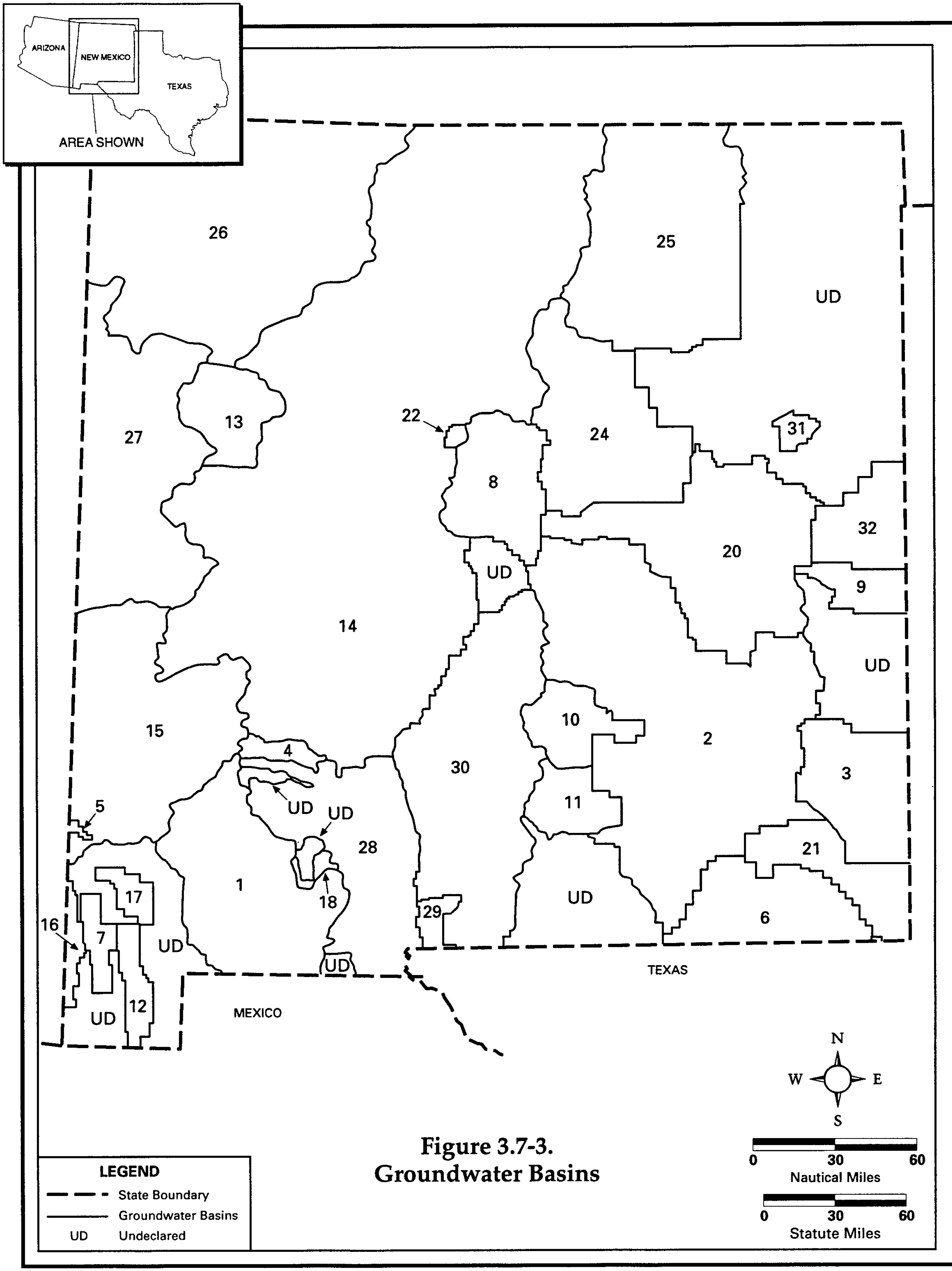

**Figure 3.7-3.
Groundwater Basins**

Table 3.7-2. Declared Groundwater Basins

Basin	Square Miles	Basin	Square Miles
1—Mesilla Valley	4,279	17—Lordsburg	329
2—Roswell	10,799	18—Nutt-Hockett	133
3—Lea County	2,180	19—Jal	15
4—Hot Springs	284	20—Fort Sumner	4,924
5—Virden Valley	19	21—Capitan	1,550
6—Carlsbad	2,347	22—Sandia	73
7—Animas	7,426	23—Las Animas Creek	131
8—Estancia	2,005	24—Upper Pecos	3,824
9—Portales	628	25—Canadian River	5,825
10—Hondo	1,101	26—San Juan	9,727
11—Penasco	903	27—Gallup	5,424
12—Playas Valley	515	28—Lower Rio Grande	3,858
13—Bluewater	1,318	29—Hueco	255
14—Rio Grande	26,209	30—Tularosa	6,070
15—Gila-San Fransico	5,659	31—Tucumcari	177
16—San Simon	263	32—Curry	1,350

Note: Designation numbers correspond to Figure 3.7-3.

Project activities of interest for groundwater resources are primarily located within the Tularosa groundwater basin, but do include activities in the undeclared groundwater basin. Holloman AFB lies entirely within the central Tularosa groundwater basin. However, it obtains some potable water from wells in the Penasco groundwater basin and surface water diversions from the area above the Hondo groundwater basin. The Oscura and Red Rio impact areas are in the north portion of Tularosa Basin. Groundwater underlying the West Otero Mesa site lies within the undeclared groundwater basin area. Melrose Range lies above the Sumner Groundwater Basin, which is part of the High Plains (Ogallala) Aquifer. In 1995, about 32,827 acre-feet of water was withdrawn, with about 64 percent from groundwater and 36 percent from surface water from the Tularosa Basin and Salt Basin (Livingston Associates, 1997). More detailed information on water consumption and supply within the ROI is provided in Section 3.11, Utilities.

Tularosa Groundwater Basin. The alluvium of the Tularosa Basin is divided into a number of distinct units. Unconsolidated sedimentary deposits of Pleistocene to mid-Holocene age, including alluvial fan (bajada) and basin-fill deposits, form the Bolson Aquifer in the central Tularosa groundwater basin. The thickness of unconsolidated sedimentary deposits ranges from zero to 3,000 feet (Burns and Hart, 1988).

Infiltration and runoff originating from the Sacramento and Organ Mountains provide the primary source of recharge to the Bolson Aquifer. Geologic conditions indicate that recharge may also occur in the alluvial fans on the southern flank of the Sacramento escarpment. Recharge along the flanks of the Sacramento Mountains east of Holloman AFB is estimated at 5,000 acre-feet per year (Orr and Meyers, 1986). However, the potential of the south escarpment area for long-term development of groundwater resources has not been investigated in great detail.

Groundwater flow in the eastern half of the Tularosa groundwater basin is generally to the south or southwest, with the exception of westward to southwestward flow adjacent to canyons on the west flank of the Sacramento Mountains. The USGS noted an area of freshwater extending for eight to 12 miles westward into the basin from the Sacramento escarpment, reaching depths as much as 1,200 feet below land surface (McLean, 1970). It is from this area that Holloman AFB withdraws groundwater for domestic supply and other uses (Huff, 1996).

Large quantities of very saline water are present in thick deposits of fine-grained sediments in the central part of the basin (Orr and Meyers, 1986). These waters have total dissolved solids (TDS) exceeding 35,000 milligrams per liter (mg/L). Limited quantities of fresh and slightly saline water are present in the alluvial fan deposits along margins of the Tularosa groundwater basin. Possibly less than four percent of the saturated sediments contain water with TDS concentrations of less than 1,000 mg/L (McLean, 1970). Also, groundwater underlying the bajadas is moderately saline, having TDS concentrations between 3,000 and 10,000 mg/L. Water having this TDS concentration is classified as hard (Orr and Meyers, 1986). While aesthetically unappealing, water at this level of hardness is suitable for public consumption under the Safe Drinking Water Act.

Because of the poor water quality throughout most of the basin, most groundwater wells do not penetrate the regional aquifer. Groundwater withdrawals are generally limited to the fringes of the basin, penetrating the alluvial fans and bajadas on the flanks of the Sacramento Mountains. As an example, a joint USGS and Bureau of Reclamation study of the eastern Tularosa Basin concluded that fresh groundwater supplies are limited to the alluvial-fan deposits that extend from about three miles south of Alamogordo south under the McGregor Range. Data from geophysical surveys indicate that about 1.4 to 2.1 million acre-feet of freshwater may be in storage in this area, not all of which is recoverable. An additional 3.6 to 5.4 million acre-feet of slightly saline water (dissolved solids concentrations between 1,000 and 3,000 mg/L) may be in storage in the same area, again not all of which is recoverable (Orr and Meyers, 1986).

Small quantities of potable groundwater may exist beneath McGregor Range. However, the quantity and quality of the available groundwater significantly limit development and use. Records obtained from the New Mexico State Engineer Office indicate that between 40 and 50 groundwater wells have been drilled on the McGregor Range. Of these, all but three windmill-powered stock wells have been abandoned. No groundwater withdrawals on McGregor Range are being made for military use at present. No information is available on groundwater being withdrawn for civilian livestock use. Howver, the combined pumpage of the three operating windmills is probably less than 5,000 gpd. Several geothermal test wells have been drilled and finished in the vicinity of Davis Dome. These geothermal wells indicate considerable mineralization of local groundwater, rendering it unsuitable for human consumption without treatment.

Groundwater availability in the northern part of the Tularosa groundwater basin appears to be principally affected by local hydrogeologic considerations. Hydrogeologic conditions at the Red Rio LDT are considerably different from those encountered in the central Tularosa groundwater basin, while hydrogeologic conditions within the Oscura target complex appear to mirror the central valley fill. Hydrogeologic conditions at the Red Rio LDT are of particular interest for this analysis because of the proposed increase in use of live munitions at that location. The specific hydrogeologic conditions on the Red Rio LDT presented here are based on a recent environmental assessment of the LDT operations (U.S. Air Force, 1994c). Groundwater depth at the LDT is estimated at approximately 50 feet, based on measurements taken at a local spring and well. The local aquifer is the Yeso Formation of the Permian age. It is an interbedded sequence of siltstone, sandstone, limestone, and gypsum. Groundwater is held in voids and solution-enlarged fractures, especially in the gypsum and limestone beds. Water yields from wells tapping those beds may be large. The Yeso is underlain by the Abo Formation, which is composed of sandstone, siltstone, and shale. The unit is generally impervious, except in areas where it is strongly fractured. Red Canyon Spring, south of the LDT, is mapped at the approximate surface contact of the Abo and Yeso formations. The spring is viewed as an expression of the impermeability of the underlying strata.

The local groundwater gradient is to the southeast, approximately parallel to Red Canyon and perpendicular to the local topographic slope. The implication is that groundwater recharge is from areas of higher elevation to the northwest and that little or no recharge originates immediately upslope from the Chupadera Mesa and the LDT. Detailed information regarding local hydrogeologic conditions is scarce. It is possible that local infiltration contributes to the flow of Red Canyon Spring. However, existing data are insufficient to evaluate this possibility.

Local groundwater enters the mapped alluvium of the Tularosa groundwater basin fill about five miles to the south-southeast of the LDT. The first surface expressions of groundwater flow are Salt Creek, Mound Spring, and Malpais Spring, which are over 20 miles to the south. Recharge of groundwater in the northern part of the Tularosa groundwater basin was estimated to equal the combined discharge of Salt Creek and Malpais Spring based on the assumption that the groundwater system is in equilibrium. On a local basis, annual recharge is estimated to be only one percent of the annual precipitation (Weir, 1965). This supports the contention that, on average, little or no recharge takes place at the LDT site. However, the karstic nature of the local aquifer and potential fracturing at the LDT suggests that the "average" recharge may not always hold.

Groundwater in the Red Rio impact area is not considered suitable for human consumption without treatment. An analysis (U.S. Air Force, 1994c) of water from Red Canyon Spring (assumed representative of local groundwater) showed sulfate concentrations of 1,880 ppm, which exceeds the standard for sulfate in drinking water (250 ppm).

Ogallala Aquifer. Regional groundwater conditions underlying Melrose Range are considerably different from those identified within the Tularosa Basin. Melrose Range is underlain by the Sumner Groundwater Basin, which is of the High Plains Aquifer (locally called the Ogallala Aquifer). The High Plains Aquifer (see Figure 3.7-3) is the major and, in some places (e.g., eastern New Mexico), the only source of potable water (U.S. Air Force, 1995). The local aquifer is associated with the Ogallala Formation, which is of Pliocene age (approximately 10 million years old), consisting of clay, silt, fine to coarse-grained sand, gravel, and caliche (calcium carbonate). The Ogallala Formation overlies an eroded surface of much older rocks, Triassic in age (138 to 240 million years old). These beds, known as the Triassic red beds, form the base of the High Plains Aquifer. The aquifer consists of saturated sediments above the top of the Triassic red beds. Aquifer thickness ranges from zero, where the Ogallala Formation wedges out against older rocks, to as much as 150 feet. However, the upper 50 feet of sediments are comprised of silty sands with zones cemented by caliche (U.S. Air Force, 1995).

The amount of surface recharge to the underlying aquifer is considered quite low. This is due to a combination of low annual rainfall coupled with high rates of evapotranspiration, low soil moisture in the vadose zone, and the presence of caliche in the upper 50 feet of sediments. Groundwater flow is generally to the east and southeast. The slope of the water table is relatively flat, at seven to 15 feet per mile (U.S. Air Force, 1995).

Groundwater withdrawals are not a major concern on Melrose Range. However, groundwater is being consistently withdrawn (mined) on properties surrounding the withdrawn area (including Cannon AFB). Localized flow patterns occur where groundwater withdrawals cause depressions to form in the local water table. The effect seems to be prevalent in areas between Cannon AFB and Melrose Range where pumping for agricultural uses has lowered the local water table (U.S. Air Force, 1995).

Undeclared Groundwater Basin. The New Mexico State Engineer Office identifies the groundwater basin beneath the Salt surface water basin as undeclared (item UD to the left of item 6 in Figure 3.7-3). Under the terms of this definition, the State Engineer Office has not identified significant groundwater use or groundwater issues to require basin designation. Existing data concerning this geologic unit which underlies the West Otero Mesa NTC site are insufficient to draw firm conclusions. The unit is suspected to drain eastward. However, the connection is not readily apparent. Small quantities of groundwater may exist beneath the West Otero Mesa site. However, it is suspected that groundwater is not present in sufficient quantity or quality to constitute a significant source of supply.

3.7.2 Projected Baseline FY00 Conditions

Hydrogeologic conditions in the region encompassing Alamogordo, Las Cruces, El Paso, WSMR, and McGregor Range may be affected by various activities by the year 2000. The Tularosa Basin is considered a mined basin because well withdrawals are in excess of natural recharge or induced recharge from streams (New Mexico State Engineer Office, 1997). Alamogordo, El Paso, Las Cruces, and the counties are actively seeking new businesses, which would result in increased population. By the year 2000, between 36,970 and 47,970 acre-feet of water would be withdrawn from groundwater and surface water sources in the Tularosa Basin. The increase over the 1995 withdrawal of 32,827 acre-feet would be related primarily to population growth in the communities using Tularosa Basin water (e.g., Alamogordo, Tularosa, Carrizozo). The variation is caused by the uncertainty of the amount of water that would be needed for irrigated agriculture (Livingston Associates, 1997). Similar increased water demands would occur in the adjacent groundwater basins. Geothermal and desalination projects are being considered for the southeast Tularosa Basin (New Mexico State Engineer Office, 1997). They could be operational by the year 2000. Neither NTC site is within (or adjacent to) areas under consideration for groundwater or energy development.

Conditions in the northern Tularosa Basin (Red Rio and Oscura target complexes) are not expected to significantly change by FY00. The northern Tularosa Basin, much of which underlies WSMR, is expected to remain rural and sparsely populated. Water supply and delivery issues would remain substantially the same as reported for FY95 conditions.

Hydrologic conditions on and adjacent to Melrose Range are not expected to significantly change by FY00. Groundwater overdraft conditions in the Ogallala Aquifer are expected to continue and may increase with prolonged drought. As

groundwater conditions continue to deteriorate, the regional water table will continue to decline, and the regional cone of depression will continue its increase under Melrose Range.

3.8 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

This section provides a description of hazardous and nonhazardous materials use and hazardous and other wastes currently generated on Holloman AFB and the ranges used by aircraft assigned to the base. No significant change in generation or use of hazardous materials or waste is expected between FY95 and FY00. As a result, the following description applies equally to both periods.

Holloman AFB is a large-quantity generator and has a permitted storage facility for hazardous wastes. In addition, some waste ordnance material is treated by open detonation at the base's permitted treatment facility.

Hazardous waste generated, transported, treated, and disposed of in the State of New Mexico is regulated under the authority granted to the state by EPA Region VI. The New Mexico Environment Department is charged with periodic granting of permits, compliance inspection, and implementation of the Resource Conservation and Recovery Act (RCRA) regulations in the State of New Mexico. Compliance inspections are conducted periodically by state regulatory officials by reviewing facilities, procedures, training, and recordkeeping activities pertaining to hazardous waste generation, storage, treatment, and disposal (Holloman AFB, 1995).

3.8.1 Hazardous Materials

Flight operations and installation maintenance processes at Holloman AFB require the use of hazardous materials. Holloman AFB stores and uses moderate amounts of paints, solvents (e.g., methylene chloride, methyl ethyl ketone, and 1,1,1-trichloroethane), thinners, adhesives, aircraft fuel, diesel, gasoline, lubricating oils, cleaners, batteries, acids, bases, chlorofluorocarbon refrigerants, and compressed gases. The base has implemented HAZMART, a pollution prevention initiative that provides for centralized management of the procurement, handling, storage, and issuing of hazardous materials and the turn-in, recovery, reuse, recycling, or disposal of hazardous wastes. HAZMART also finds new users for unneeded chemicals. Bioenvironmental engineering personnel conduct health risk evaluations on procurement requests for hazardous materials. The base Hazardous Waste Management Plan identifies hazardous waste generators at Holloman AFB and addresses the proper packaging, labeling, storage, handling and transportation of hazardous material, recordkeeping, spill contingency and response requirements, education and training of appropriate personnel, and the waste analysis plan. The current plan is dated June 1997.

A separate action (the drawdown of the AT-38 maintenance activity) resulted in an estimated reduction of 10 percent of the hazardous materials used.

3.8.2 Hazardous Waste Management

The major hazardous waste-generating activities at Holloman AFB include maintenance of aircraft (including aircraft corrosion control), munitions, vehicles, and ground support equipment. Other waste-generating activities include Civil Engineering infrastructure maintenance, fuel handling and storage, and the provision of certain medical services. Wastes generated in maintenance activities include spent solvents, waste oils, absorbents contaminated with fuel, oil, and/or hydraulic fluid, contaminated fuels and greases, and plastic media bead-blasting residue and filters. Wastes from corrosion control activities include spent solvents and thinners, waste paint, contaminated rags, sanding debris, filters, and contaminated paper and tape. In addition, nickel-cadmium and lithium batteries are used on-base and are disposed of as hazardous waste. Approximately 197,000 pounds of hazardous wastes were disposed of in CY96. Additionally, approximately 62,500 pounds of Safety Kleen solvent were recycled during the year. In the first three quarters of CY97, 164,756 pounds of hazardous waste were disposed of and over 42,000 pounds of Safety Kleen solvent were recycled (Hartell, 1997).

During the May-August time period of 1996, the GAF used approximately 2,650 pounds of hazardous material while supporting the 12 assigned Tornado aircraft; this represents an approximate average of 660 pounds per aircraft per year (O'Brain, 1996; Setter, 1996). During the May-October time period of 1996, eight drums containing 974 pounds of rags contaminated with solvents, paint waste, and petroleum products were turned in for disposal (Hartell, 1997). In October 1996, a water/detergent mixture replaced solvents to clean the Tornado guns at Holloman AFB. The mixture is reused until no longer effective and is then disposed of as a hazardous waste. The amount of hazardous waste that is generated is the same as when using solvents.

All hazardous waste generation areas at Holloman AFB are initial accumulation points; there are less than 100 of these points. The 90-day storage area on-base receives initial accumulation point generated wastes for short-term storage and waste characterization, which is later transported to the EPA-permitted on-base DRMO for long-term storage. DRMO is responsible for the disposal of excess property and waste generated by Holloman AFB, and accomplishes this mission through reuse, transfer, sale, donation, or ultimate disposal. It manages the disposal contract for hazardous wastes. DRMO is the generator-of-record on hazardous waste manifests of wastes shipped off-base and is a part of the hazardous waste management program. DRMO provides many of the records required to track hazardous waste activity and maintain regulatory compliance at the base. The DRMO storage facility is the only facility on Holloman AFB permitted to store hazardous wastes for longer than 90 days.

Scheduled maintenance and clearance operations are conducted on the ranges at least annually. Maintenance operations include painting of targets such as old trucks, jeeps, tanks, aircraft, and metal conex containers (simulated buildings) with water-based latex paint, repairing fences, and grading roads and firebreak areas. Clearance operations include removing targets that have been destroyed, replacing

them with other old vehicles, and grooming the impact areas by grading, blading, and dragging the surfaces. The destroyed targets are disposed of as nonhazardous waste through the DRMO. Fluids and batteries are removed from the replacement targets and taken to Holloman AFB for recycling or disposal. Approximately 500,000 pounds of nonhazardous scrap metal is removed and recycled annually.

3.8.3 Munitions

Holloman AFB aircraft expend training munitions on the Oscura and Red Rio impact areas and McGregor and Melrose Ranges, and live munitions on the Red Rio LDT. These areas are cleaned at least annually. The EOD renders unexploded munitions nonexplosive through in-place detonation. The NTC sites are located within the safety area for various weapons testing and training activities on McGregor Range. The Tularosa Basin site is contaminated with debris from missile firings and UXO. The amount and composition of the debris at the two NTC training option sites has not been determined. The presence of UXO on the West Otero Mesa site is much less likely than on the Tularosa Basin Site (see Section 2.1.4.4). There may in fact be no contamination of the West Otero Mesa NTC site, but because it lies within the safety area for weapons testing on McGregor, it remains possible that UXO is present. No cleanup activities have been carried out in these areas (see Section 2.1.4.4).

3.8.4 Medical Wastes

The base hospital generates approximately 1,000 pounds of medical waste per month. The medical wastes are stored on-site for disposal off-site through a contract. The wastes are picked up twice a week (Lopez, 1996).

3.8.5 Installation Restoration Program

As a result of handling hazardous materials, areas can become contaminated. Such areas become part of the Installation Restoration Program (IRP). Activities at IRP sites are controlled to prevent the spread of contamination and facilitate cleanup. Proposed construction projects are routinely reviewed by the Holloman AFB IRP Manager to determine whether they would occur in an area identified under the IRP. Construction activities in an IRP area would include contamination control methods and procedures.

Under the proposed action, the installation of utilities would occur near IRP Site 59. Past activities in this area have resulted in soil contamination from spilled fuel.

3.9 SOCIOECONOMICS

This section describes the general features of the economy and social services that could be affected by the proposed action. This description summarizes information on the baseline features of the area surrounding Holloman AFB.

The ROI is defined as the three-county region of Otero and Doña Ana counties in New Mexico and El Paso County in Texas. Otero County is included in the ROI because Holloman AFB is located there. The ROI is often selected to be a local economic trading zone, such as a Metropolitan Statistical Area (MSA). The ROI definition used here includes both the Las Cruces MSA (Doña Ana County) and the El Paso MSA (El Paso County). Although Las Cruces and El Paso are located more than 75 miles from Holloman AFB, many of the purchases made by the base and much of the secondary economic effects are expected to occur in these areas. The ROI is the basic level at which economic impacts are estimated using input-output analysis (see Appendix G for a discussion of impacts methodology).

Otero County would be expected to experience the greatest impacts in the ROI, should any occur. There are 16 communities located within Otero County: Alamogordo, Bent, Cloudcroft, High Rolls, Holloman AFB, La Luz, Mayhill, Mescalero, Mountain Park, Orogrande, Piñon, Sacramento, Sunspot, Timberon, Tularosa, and Weed. In addition, the county is home to the Mescalero Apache Indian Reservation and includes portions of Lincoln National Forest. The City of Alamogordo is the largest urban area in Otero County; 92 percent of the people working at Holloman AFB live in Alamogordo. The focus of the following discussion is on Otero County. However, a broader region, including counties in Texas, New Mexico, and Arizona, may be affected by the anticipated changes in overflights. The anticipated impacts could involve concerns with noise levels; therefore, these broader areas are addressed under Section 3.9.8, Low-Income and Minority Populations.

This section analyzes whether the proposed action would have disproportionately high and adverse effects on minority or low-income populations with regard to overflight noise. MTRs and MOAs that would be used for proposed training activities (under any of the training options being considered) overlie 82 different census tracts/BNAs in 27 counties in New Mexico, Texas, and Arizona (see Section 3.9.8, Low-Income and Minority Populations, for a description of census tracts/BNAs). However, not all of these tracts are adversely affected by noise. The "Schultz curve" predicts the average response of communities to various noise levels (see Section 4.2). The most common point referred to on the updated and validated Schultz curve is 65 dB. This is a benchmark often applied to determine residential land-use compatibility around airports or highways. By extension, it can be used as one criterion in planning of airspace. The 65 dB L_{dn} level is useful to recognize as a level that, when exceeded is normally not compatible with residential land use. Therefore, the search for disproportionately high and adverse effects on low-income and minority populations is limited to those areas where L_{dnmr} dB levels are at 65 dB or higher.

The only areas analyzed in this document at which the day-night noise level would exceed 65 dB are Holloman AFB, impact areas within the existing bombing ranges (e.g., Red Rio and Oscura impact areas on WSMR, and Melrose Range) and within the proposed NTC impact area. Other than the residential areas on Holloman AFB, none of these areas contain any dwellings. Consequently, no populations would be

subjected to significant adverse effects and there would be no disproportionately high and adverse effects on minority or low-income populations.

3.9.1 Population

Table 3.9-1 shows the trends in demographic and economic activity for the three counties in the ROI (Doña Ana, El Paso, and Otero) in comparison with the two states (Texas and New Mexico) and the U.S. Statistics are reported for the last three census years (1970, 1980, and 1990) and the last two years for which county-level data are available (1993 and 1994). This section highlights trends in population; the next section discusses trends in employment, earnings, and income.

The ROI had a population of 874,600 people in 1994, the latest year of reported county-level population statistics. Of that total, 54,300 people lived in Otero County (6.21 percent), 155,500 lived in Doña Ana County (17.78 percent) and 664,800 (76.01 percent) lived in El Paso County. Between 1970 and 1994, ROI population almost doubled, growing at an average annual rate of 2.60 percent per year. Table 3.9-2 shows forecasts for population, employment, earnings, and per capita income for Otero County to the year 2000. These forecasts were based on the population projections developed by the Otero County Economic Development Council (OCEDC, 1996). These data show that population growth for Otero County has been slower than the growth for the ROI, averaging only 1.14 percent per year from 1970 to 1994. Forecasted population growth for Otero County shows population increasing at roughly one percent per year to the year 2000. Compared to the national averages, the Otero County population includes a relatively high share of high school graduates, and a relatively high proportion of the population (nearly one-fourth) is of Hispanic heritage (see Appendix G, G.2.1).

3.9.2 Employment and Income

The ROI reported 387,641 jobs in 1994 with 26,648 (6.87 percent) in Otero County, 64,522 (16.64 percent) in Doña Ana County and 296,471 (76.49 percent) in El Paso County. Between 1970 and 1994, ROI employment almost doubled, growing at an average annual rate of 2.90 percent per year (see Table 3.9-1). Table 3.9-3 shows the distribution of employment by major industrial sector in 1994 for the U.S., New Mexico, the ROI, and Otero County. Farming employment (502 employees) plus jobs in the Agricultural Services sector (243 employees) contributed 2.79 percent of total employment in Otero County in 1994. This is smaller than the share of the two combined sectors in New Mexico (3.75 percent) and the U.S. (3.25 percent). Table 3.9-4 shows the average earnings per worker in the major industrial sectors in 1994. Average earnings in farming and agricultural services were lower than all other sectors in Otero County in 1994. Generally, average earnings in Otero County were lower than in the ROI, New Mexico, and the U.S.

Holloman AFB is the primary employer in Otero County, providing one out of five jobs in 1996. As reported in Chapter 2.0, there are an estimated 5,900 people working at Holloman, including military, civilian, and GAF personnel. The Inn of the Mountain Gods is the next largest employer in the county. This resort is located on

Table 3.9-1. Historical Trends in Economic Activities for the Holloman AFB ROI, 1970-1994

Region/Indicator	1970	1980	1990	1993	1994	Average Annual Growth 1970-1994	1980-1994	1990-1994	1993-1994
UNITED STATES:									
Population	203,798,700	227,255,000	249,402,300	257,783,000	260,341,000	1.03%	0.98%	1.08%	0.99%
Employment	91,093,200	113,725,800	138,981,300	140,817,500	144,390,500	1.94%	1.72%	0.96%	2.54%
Services	16,726,200	24,558,100	38,188,000	40,830,400	42,239,000	3.94%	3.95%	2.55%	3.45%
Retail Trade	13,672,000	17,852,500	23,019,800	23,457,500	24,276,400	2.42%	2.22%	1.34%	3.49%
Manufacturing	19,684,400	20,776,600	19,755,600	18,739,900	19,024,700	-0.14%	-0.63%	-0.94%	1.52%
Earnings per Worker	7,219	14,783	24,205	27,478	28,291	5.86%	4.75%	3.98%	2.96%
Services	6,230	12,896	22,761	25,915	26,681	6.25%	5.33%	4.05%	2.95%
Retail Trade	5,248	9,457	14,277	15,693	16,157	4.80%	3.90%	3.14%	2.95%
Manufacturing	8,901	20,137	32,992	37,864	39,282	6.38%	4.89%	4.46%	3.75%
Per Capita Income	4,047	9,940	18,666	20,812	21,696	7.25%	5.73%	3.83%	4.25%
NEW MEXICO:									
Population	1,023,200	1,310,300	1,519,900	1,615,600	1,653,500	2.02%	1.68%	2.13%	2.35%
Employment	398,360	595,389	772,627	833,406	867,045	3.29%	2.72%	2.92%	4.04%
Services	78,524	128,176	210,279	235,964	245,349	4.86%	4.75%	3.93%	3.98%
Retail Trade	64,661	97,911	136,988	149,592	157,245	3.77%	3.44%	3.51%	5.12%
Manufacturing	21,931	35,942	48,593	48,853	51,477	3.62%	2.60%	1.45%	5.37%
Earnings per Worker	6,502	13,532	19,632	22,422	23,100	5.42%	3.89%	4.15%	3.02%
Services	5,873	11,755	18,587	21,484	22,173	5.69%	4.64%	4.51%	3.21%
Retail Trade	4,785	9,049	12,505	14,113	14,555	4.74%	3.45%	3.87%	3.13%
Manufacturing	6,942	15,528	25,401	28,682	30,477	6.36%	4.93%	4.66%	6.26%
Per Capita Income	3,140	8,147	14,213	16,295	17,038	7.30%	5.41%	4.64%	4.56%
TEXAS:									
Population	11,236,800	14,339,000	17,045,500	18,022,000	18,378,300	2.07%	1.79%	1.90%	1.98%
Employment	5,032,337	7,474,125	9,334,854	9,860,312	10,174,016	2.98%	2.23%	2.18%	3.18%
Services	933,966	1,462,848	2,496,060	2,730,358	2,830,977	4.73%	4.83%	3.20%	3.69%
Retail Trade	787,885	1,196,273	1,546,973	1,652,750	1,720,358	3.31%	2.63%	2.69%	4.09%
Manufacturing	755,842	1,067,805	1,033,652	1,034,570	1,059,581	1.42%	-0.06%	0.62%	2.42%
Earnings per Worker	6,617	15,032	23,021	26,453	27,092	6.05%	4.30%	4.15%	2.41%
Services	5,515	13,008	21,616	24,756	25,487	6.59%	4.92%	4.20%	2.95%
Retail Trade	4,915	9,982	14,012	15,267	15,681	4.95%	3.28%	2.85%	2.71%
Manufacturing	8,630	20,840	33,463	38,545	39,596	6.55%	4.69%	4.30%	2.73%
Per Capita Income	3,618	9,840	16,749	19,023	19,716	7.32%	5.09%	4.16%	3.64%

Table 3.9-1. Historical Trends in Economic Activities for the Holloman AFB ROI, 1970-1994 (continued)

Region/Indicator	1970	1980	1990	1993	1994	Average Annual Growth			
						1970-1994	1980-1994	1990-1994	1993-1994
ROI*									
Population	472,200	626,400	784,600	851,500	874,600	2.60%	2.41%	2.75%	2.71%
Employment	195,275	275,311	356,054	379,164	387,641	2.90%	2.47%	2.15%	2.24%
Services	30,537	46,988	82,002	89,643	90,416	4.63%	4.79%	2.47%	0.86%
Retail Trade	28,832	43,561	61,482	65,310	68,056	3.64%	3.24%	2.57%	4.20%
Manufacturing	26,288	40,142	47,837	50,777	51,913	2.88%	1.85%	2.07%	2.24%
Earnings per Worker	6,124	12,120	18,881	21,277	21,711	5.41%	4.25%	3.55%	2.04%
Services	4,970	10,687	17,192	19,508	19,927	5.96%	4.55%	3.76%	2.15%
Retail Trade	4,637	8,998	12,553	13,693	14,046	4.73%	3.23%	2.85%	2.58%
Manufacturing	6,216	12,815	20,114	21,883	22,676	5.54%	4.16%	3.04%	3.62%
Per Capita Income	2,957	6,472	11,686	12,861	13,159	6.42%	5.20%	3.01%	2.32%
OTERO COUNTY:									
Population	41,400	44,800	51,800	52,800	54,300	1.14%	1.38%	1.19%	2.84%
Employment	19,213	22,798	26,247	26,315	26,648	1.37%	1.12%	0.38%	1.27%
Services	3,407	3,853	6,052	6,089	6,306	2.60%	3.58%	1.03%	3.56%
Retail Trade	1,989	3,186	3,929	4,032	4,190	3.15%	1.98%	1.62%	3.92%
Manufacturing	1,166	1,029	1,369	1,373	1,116	-0.18%	0.58%	-4.98%	-18.72%
Earnings per Worker	6,923	12,290	18,764	21,329	21,505	4.84%	4.08%	3.47%	0.83%
Services	6,316	11,463	17,265	19,806	20,647	5.06%	4.29%	4.57%	4.25%
Retail Trade	4,763	8,483	10,945	12,199	12,766	4.19%	2.96%	3.92%	4.65%
Manufacturing	9,819	14,457	24,141	27,230	26,582	4.24%	4.45%	2.44%	-2.38%
Per Capita Income	3,019	7,165	12,156	14,070	14,298	6.69%	5.06%	4.14%	1.62%
DOÑA ANA COUNTY:									
Population	70,300	97,200	136,500	151,800	155,500	3.36%	3.41%	3.31%	2.44%
Employment	27,017	39,576	59,165	63,156	64,522	3.69%	3.55%	2.19%	2.16%
Services	4,191	7,020	12,611	14,823	14,924	5.43%	5.53%	4.30%	0.68%
Retail Trade	3,998	5,490	10,136	10,878	11,381	4.46%	5.35%	2.94%	4.62%
Manufacturing	1,229	2,694	4,068	2,718	2,755	3.42%	0.16%	-9.28%	1.36%
Earnings per Worker	6,413	11,594	18,555	20,512	20,915	5.05%	4.30%	3.04%	1.96%
Services	4,823	8,951	14,761	18,085	17,930	5.62%	5.09%	4.98%	-0.86%
Retail Trade	4,531	8,595	11,457	13,167	13,408	4.62%	3.23%	4.01%	1.83%
Manufacturing	6,255	13,979	21,936	20,005	22,558	5.49%	3.48%	0.70%	12.76%
Per Capita Income	2,897	6,632	12,281	13,258	13,698	6.69%	5.32%	2.77%	3.32%

Table 3.9-1. Historical Trends in Economic Activities for the Holloman AFB ROI, 1970-1994 (continued)

Region/Indicator	1970	1980	1990	1993	1994	Average Annual Growth 1970-1994	1980-1994	1990-1994	1993-1994
El PASO COUNTY:									
Population	360,500	484,400	596,300	646,900	664,800	2.58%	2.29%	2.76%	2.77%
Employment	149,045	212,937	270,642	289,693	296,471	2.91%	2.39%	2.30%	2.34%
Services	22,939	36,115	63,339	68,731	69,186	4.71%	4.75%	2.23%	0.66%
Retail Trade	22,845	34,885	47,417	50,400	52,485	3.53%	2.96%	2.57%	4.14%
Manufacturing	23,893	36,419	42,400	46,686	48,042	2.95%	2.00%	3.17%	2.90%
Earnings per Worker	5,969	12,200	18,964	21,439	21,903	5.57%	4.27%	3.67%	2.16%
Services	4,797	10,942	17,669	19,789	20,292	6.19%	4.51%	3.52%	2.55%
Retail Trade	4,645	9,109	12,921	13,926	14,286	4.79%	3.27%	2.54%	2.59%
Manufacturing	6,038	12,683	19,810	21,835	22,592	5.65%	4.21%	3.34%	3.47%
Per Capita Income	2,962	6,377	11,510	12,669	12,940	6.34%	5.18%	2.97%	2.14%

* ROI = Region of Influence (Otero and Doña Ana counties, New Mexico, and El Paso County, Texas).

Source: U.S. BEA, 1996a, 1996b.

Table 3.9-2. Forecasted Trends in Economic Activities for Otero County, 1994-2000

Year	Population (No. of People)	Employment (No. of People)	Earnings/Job ($/year)	Per Capita Income ($/year)
1994	54,300	26,648	21,505	14,298
1995	54,792	26,728	22,023	14,771
1996	55,313	26,808	22,554	15,260
1997	55,838	26,888	23,096	15,765
1998	56,368	26,969	23,654	16,287
1999	56,903	27,050	24,224	16,826
2000	57,437	27,131	24,808	17,383
Estimated Average Annual Growth 1995-2000*	0.95%	0.30%	2.41%	3.31%

Source: Otero County Economic Development Council, Inc., 1996, p.3 and SAIC calculations. Using population forecasted by OCEDC, forecasts of employment, earnings, and per capita income were developed by assuming that the ratio of population growth to growth in each of the three other variables would remain equal to their relative average share in 1990 to 1994.

Table 3.9-3. Employment by Industrial Sector for the United States, New Mexico, the ROI, and Otero County (1994)

Sector	United States		New Mexico		ROI		Otero County	
	Number Employed	Share of Employment	Number Employed	Share of Employment	Number Employed	Share of Employment	Number Employed	Share of Employment
Farming	3,001,000	2.08%	21,282	2.45%	4,125	1.06%	502	1.88%
Private								
Agricultural Services, Forestry, Fisheries, and Other	1,693,800	1.17%	11,267	1.30%	4,986	1.29%	243	0.91%
Mining	912,400	0.63%	20,297	2.34%	711	0.18%	51	0.19%
Construction	7,286,600	5.05%	55,700	6.42%	19,186	4.95%	1,308	4.91%
Manufacturing	19,024,700	13.18%	51,477	5.94%	51,913	13.39%	1,116	4.19%
Transportation & Public Utilities	6,922,600	4.79%	35,359	4.08%	17,391	4.49%	1,054	3.96%
Wholesale Trade	6,774,300	4.69%	31,481	3.63%	15,515	4.00%	333	1.25%
Retail Trade	24,276,400	16.81%	157,245	18.14%	68,056	17.56%	4,190	15.72%
Finance, Insurance & Real Estate	10,634,700	7.37%	51,163	5.90%	20,328	5.24%	1,109	4.16%
Services	42,239,000	29.26%	245,349	28.30%	90,416	23.33%	6,306	23.66%
Government & Government Enterprises								
Federal Civilian	3,080,000	2.13%	31,927	3.68%	15,360	3.96%	2,288	8.59%
Military	2,371,000	1.64%	22,589	2.61%	22,221	5.73%	5,555	20.85%
State & Local Governments	16,174,000	11.20%	131,909	15.21%	57,433	14.82%	2,593	9.73%
TOTAL EMPLOYMENT	**144,390,500**	**100.00%**	**867,045**	**100.00%**	**387,641**	**100.00%**	**26,648**	**100.00%**

Source: Bureau of Economic Analysis, 1996b.

Table 3.9-4. Average Earnings (in Dollars) Per Job by Industrial Sector for the United States, New Mexico, the ROI and Otero County (1994)

Sector	United States	New Mexico	ROI	Otero County
Farming	17,343	19,883	28,653	4,078
Private				
Agricultural Services, Forestry, Fisheries & Other	15,825	10,869	11,093	10,798
Mining	39,839	34,866	12,314	34,843
Construction	29,934	23,454	19,147	17,570
Manufacturing	39,282	30,477	22,676	26,582
Transportation & Public Utilities	39,379	34,860	34,556	27,959
Wholesale Trade	37,611	27,156	27,544	22,294
Retail Trade	16,157	14,555	14,046	12,766
Finance, Insurance & Real Estate	28,478	16,927	14,930	11,315
Services	26,681	22,173	19,927	20,647
Government & Government Enterprises				
Federal Civilian	42,656	40,997	40,492	31,375
Military	20,211	23,455	25,338	27,490
State & Local Governments	29,400	25,615	24,635	21,734
AVERAGE EARNINGS	**28,291**	**23,100**	**21,711**	**21,505**

Source: Bureau of Economic Analysis, 1996b.

the Mescalero Apache Indian Reservation. Most of the jobs at the Inn of the Mountain Gods are held by Native Americans living on the reservation, and it has little impact on employment in the rest of the county (Dalby, 1996).

Agricultural activity in Otero County is lower than the average for New Mexico and the U.S. In 1990, farm earnings in Otero County totaled $7.6 million, or approximately 1.4 percent of Otero County's total income of $540.4 million. New Mexico reported that 2.6 percent of its personal income in 1990 was derived from farming. The U.S. as a whole reported farm earnings as 1.8 percent of total personal income in 1990. The reported farm population in the county was 500, which represented one percent of the population. New Mexico also had one percent of its population living on farms in 1990. The U.S. as a whole reported farm population was 1.6 percent of the total (Bureau of the Census, 1994).

Table 3.9-5 compares agricultural census statistics for New Mexico and Otero County in 1987 and 1992. Otero County reported 477 farms in 1992 with more than 1.1 million acres. The total value of agricultural products sold in 1992 by Otero County farms was $9.8 million, representing 0.8 percent of New Mexico's value of agricultural products sold. Less than half of the farms in the county have an inventory of cattle and calves, with the total number of cattle reported at 26.2 thousand in 1992 or 1.6 percent of the New Mexico inventory. The net cash return from agricultural sales was $991 thousand in Otero County in 1992, down from $2,718 thousand in 1987. The net cash return from agricultural sales represented only 0.1 percent of total personal income in 1992.

Since 1990, the unemployment rate in Otero County has been higher than New Mexico, Texas, and the national average. The influx of population associated with the establishment of the German training mission in 1995 kept the economy more active than it would have been otherwise. The Otero Chamber of Commerce estimates that the October 1996 unemployment rate was about eight percent.

Alamogordo has a number of unemployed, unskilled, and semi-skilled workers. There is also a pool of well-paid, highly trained workers who have been retired or otherwise left WSMR or Holloman AFB that are also included in the ranks of the unemployed. Approximately 40 such workers leave WSMR and Holloman AFB each month, and they would stay in the area if jobs were available (Dalby, 1996).

The Alamogordo Chamber of Commerce plans to build on the pool of highly skilled workers leaving WSMR and Holloman AFB, combining it with the proximity to sophisticated, unique testing facilities owned by the government that can be made available to private testing and evaluation companies. The Alamogordo Chamber has been promoting Alamogordo as a good location for companies developing and/or using state-of-the-art instrumentation and measuring devices (Dalby, 1996).

Average annual earnings per worker (in current dollars) were reported to be $21,277 in the ROI in 1994. U.S. military personnel reported average annual earnings of $31,232 in FY96 (total military payroll was approximately $144 million). The average annual earnings of appropriated civilian personnel was $27,861 (Valdez, 1996). GAF

Table 3.9-5. Agricultural Trends in New Mexico and Otero County

Item/Category	New Mexico			Otero County			County Share	
	1987	1992	% Change	1987	1992	% Change	1987	1992
Number of Farms	14,249	14,279	0.0%	439	477	1.7%	3.1%	3.3%
Land in Farms (1,000 Acres)	46,018.0	46,849.2	0.4%	1,131.0	1,166.0	0.6%	2.5%	2.5%
Market Value of Agricultural Products Sold (Million Dollars)	1,060.1	1,258.9	3.5%	10,328	9,789	-1.1%	1.0%	0.8%
Net Cash Return from Agricultural Sales (Thousand Dollars)	165,007	196,574	3.6%	2,718	991	-18.3%	1.6%	0.5%
Total Personal Income (Million Dollars)	17,587.1	24,534.0	6.9%	555.6	709.0	5.0%	3.2%	2.9%
Share of Net Cash Return from Agricultural Sales to Total Personal Income	0.9%	0.8%	NE	0.5%	0.1%	NE	NE	NE
Number of Farms with Cattle & Calves Inventory	8,926	8,964	0.1%	223	212	-1.0%	2.5%	2.4%
Number of Cattle & Calves in Inventory (1,000)	1,445.1	1,590.0	1.9%	27.0	26.2	-0.6%	1.9%	1.6%
Number of Cattle & Calves Sold (1,000)	1,298.6	1,182.0	-1.9%	16.5	15.1	-1.8%	1.3%	1.3%
Average Cash Return/Farm ($)	11,583	13,767	3.5%	6,205	2,077	-19.7%	53.6%	15.1%

NE = not estimated.

Source: Bureau of the Census, 1997a & 1997b; Bureau of Economic Analysis, 1996b.

personnel earnings were estimated at $18 million in 1996, which results in an estimated average annual earnings of approximately $58,000 including a 50 percent bonus for service overseas (Brooke, 1996; Olesen, 1996).

3.9.3 Housing

The total number of housing units in the ROI in 1990 was 259,798 (see Table 3.9-6). The majority of the ROI's housing units were single-family structures in 1990, followed by multifamily units and mobile homes. In contrast, Otero County had a smaller share of multifamily units than the ROI and a much larger share of mobile homes (see Appendix G, G.2.3 for more details on the housing stock in the ROI). The community housing vacancy rate in the fall of 1996 was estimated to be between seven and 10 percent. In a quick survey of seven apartment complexes located in Alamogordo in October 1996, 50 units (or approximately 7.5 percent of the total sample of 667 units) were reported vacant (Balok, Chata, Connely, Driscoll, Geron, Price, and Roberts, 1996). In general, the rental market was characterized as depressed in the summer of 1996. There were a number of houses that were available to rent in May 1996 but remained unoccupied until August or September of that year. This compares to the usual market where units are rented in two to four weeks (Geron, 1996). There has also been an increase in the number of rental units listed in the local newspaper. The average number of listings in the Sunday *Alamogordo Daily News* in the six weeks from April 14, 1996 through May 19, 1996 was 68.5 units. In the six-week period from September 1, 1996 to October 6, 1996, the average number of rental listings increased to 95.2 units, a growth of 39 percent over the six-month period from April to October.

A new 80-unit apartment complex was completed in the summer of 1996 (Dalby, 1996). This was the first multifamily housing that had been built in Alamogordo in over a decade. More than 60 single-family homes were built for lease in 1994-1995. These homes typically have four bedrooms and three baths, and two-thirds of them include swimming pools. The typical rent for these units is $1,500 per month. One developer is building 40 townhouses on First Street. Another investor plans to build 200 apartments on the corner of First and Scenic streets (Dalby, 1996).

The German government helps GAF personnel compensate for the higher off-base rental prices in the U.S. (Olesen, 1996). GAF personnel are expected to pay 18 percent of their salary for housing; any additional charge is covered by the German government, assuming that the rental unit has been approved (Dalby, 1996; Van Cott, 1996). GAF personnel get a 50 percent pay bonus for service overseas (Brooke, 1996), and their basic housing allowance is higher than the average U.S. military housing allowance. Given the incentive structure currently in place, the German families have been demanding rentals at the higher end of the housing market price range, requesting a number of amenities that are not often provided (Dalby, 1996; Kidd, 1996). Although not all of the new units go to German families, the growth in housing demand that occurred in 1994-1995 generated new housing starts in Alamogordo.

Table 3.9-6. Housing Characteristics (1990)

Region	Single Family Units	Multi-Family Units	Mobile Homes	Total Housing	Occupied Units	Vacancy Rate	Average Household Size
New Mexico	415,776	113,335	102,947	632,058	542,709	14.1%	2.80
Texas	4,602,751	1,863,592	542,656	7,008,999	6,070,937	13.4%	2.81
ROI (3 counties)	165,589	65,221	28,988	259,798	241,550	7.0%	3.25
Otero County	14,921	2,152	6,104	23,177	18,155	21.7%	2.85
Doña Ana County	27,825	8,968	12,355	49,148	45,029	8.4%	3.03
El Paso County	122,843	54,101	10,529	187,473	178,366	4.9%	3.34

Source: Bureau of the Census, 1993.

In addition to the demand for housing by GAF personnel with families, almost all single GAF personnel are living off-base. The GAF commander has waived the requirement that all unaccompanied airmen aged 25 or under live in on-base quarters. This waiver will end in 1999. Any effect on the housing market will also end.

3.9.4 Education

Enrollments. The Alamogordo Municipal School District No. 1 serves students living in the City of Alamogordo, the communities of Tularosa and La Luz, and Holloman AFB. The district has 14 schools, including 11 elementary schools, one middle school, one junior high school, and one high school. Three of the district's schools are located on Holloman AFB, including Holloman Primary School (K-2), Holloman Intermediate School (3-5), and Holloman Middle School (6-8). Students in grades K-8 who reside on Holloman AFB attend the three on-base schools. High school students living on Holloman AFB attend off-base schools.

Enrollments in the district's schools have increased less than one percent over the last four years, from 7,987 in 1992 to 8,023 in 1996 (Johnson, 1996). Over the same period, the number of certified teachers in the district has grown from 392 to 449, an increase of 14.5 percent, and the student/teacher ratio has decreased from 20:1 to 18:1. Appendix G, Table G.2.4-1 shows fall 1996 enrollments in the school district by grade level and the associated number of schools. The district's enrollments are currently above its design capacity. Enrollments are projected to remain stable over the next five years (Pacheco, 1996). A bond issue is being considered by the school board to fund construction of an additional elementary school and middle school.

There are currently approximately 83 German students enrolled in the Alamogordo Public Schools (Scott, 1997). Approximately 40 of these students attend the German school located at Buena Vista Elementary School. The German school was opened in the fall of 1996 to accommodate student dependents of GAF personnel stationed at Holloman AFB. The school has its own principal and includes grades 1-4. Students in higher grades attend other Alamogordo schools. There are currently two separate classes for German students in grades 1-2 and grades 3-4 at the existing German school, and plans are in place to add a class for grades 5-6 in September 1997 and a class for grades 7-8 in September 1998 (Janssen, 1997). The two additional classrooms would be located in an existing double-wide portable classroom at Buena Vista Elementary School, which is currently rented by the German school for use as office and storage space.

School Finance. The German school rents facilities from the Alamogordo Public Schools. In addition, the district receives state aid for German students attending grades 5-12 in the public schools. The Alamogordo Municipal School District reported revenues of $34.0 million and expenditures of $33.6 million in FY95 (Appendix G, Table G.2.4-2). This included activities in the general fund, special revenue fund, capital projects fund, and debt service fund. Approximately 80.1 percent of revenues for the school district comes from state sources, including redistribution of property taxes, 11.1 percent from Federal sources, and 10.8 percent

from local sources. The largest expenditure is for instruction, $17.4 million or 51.8 percent, followed by administration, $4.8 million or 14.3 percent. The fund balance was $3.9 million or 11.6 percent of expenditures, an increase of 15.2 percent over the prior year. The level of bonded indebtedness is currently $5.7 million, consisting of two General Obligation Bonds maturing in the years 2005 and 2008. Total assessed property valuation in the district is $277 million.

In 1996, the school district received approximately $914,724 in PL 103-382 (federal impact aid) funding for military dependents of Holloman AFB personnel who are enrolled in the district. This represented funding for 1,023 on-base students and 1,072 off-base students. The district receives no federal impact aid for school-age dependents of Holloman AFB civilian personnel, who live in the community and support the schools with their tax dollars.

3.9.5 Police and Fire Protection

The Alamogordo community is served by a "Department of Public Safety" that incorporates fire protection, law enforcement, and emergency services into one function. The City of Alamogordo currently has 73 officers who are cross-trained to handle both police and firefighting duties. Officers also provide first-responder emergency support. The police carry their firefighting gear and special equipment with them in their patrol car, enabling them to respond immediately in the event of a fire. The actual number of officers fluctuates between 70 and 76, depending on turnover and training requirements (Montgomery, 1996). Out of a rating scale of 1 to 10 (with 10 being the worst), Alamogordo's fire insurance rating is 5, or slightly below average. No cleanup activities have been carried out in these areas.

Alamogordo is in the process of getting approval for a fifth fire station, to be located on South Florida. Opening this station would require hiring another fire equipment operator to be based at this location. It is anticipated that the new station can be opened in 1998 or 1999. The city has already secured the land for the station and the city staff is coordinating with the State of New Mexico to obtain funding to help cover some of the construction costs (Montgomery, 1996).

Other law enforcement personnel operating in Otero County include 23 personnel from the Sherrif's Department and 13 state police. Otero County had the lowest rate of serious crimes in 1991 of the regions examined (5,200 per 100,000 population), followed by Alamogordo (5,437), both of which had lower serious crime rates than New Mexico, Texas, or the U.S. (Appendix G, Table G.2.5-1).

3.9.6 Hospitals and Medical Care

Medical care is administered at the Gerald Champion Memorial Hospital (GCMH) in Alamogordo and at the Holloman AFB medical center. GCMH is licensed for 91 beds and the base hospital is currently a seven-bed facility. The Holloman medical center is in the process of becoming an ambulatory surgery facility. At GCMH, the hospital is currently staffed to care for 62 patients, which has been the recent level of demand. There are 44 doctors associated with GCMH, and the hospital has been

active in recruiting new doctors to settle in the area (OCEDC, Inc., 1996; Randall, 1996).

General care is available at GCMH, but specialty requirements are not. For example, bypass surgery is not conducted at GCMH, although cardiologists hold clinics for residents several times a month. Bypass surgery is done in El Paso or Albuquerque. Ambulance service for the area is provided by a private company. If there is an emergency such that a patient needs specialized health care immediately, Critical Air has a fixed-wing airplane equipped to fly the patient to a larger city (Randall, 1996).

The hospital is in the early stages of planning to build a new facility. GCMH is out of space in their current building and there is no adjacent land available for expansion. A high-priority need is to expand their ambulatory care unit since so much of their services now involves one-day surgery. Current plans call for the new hospital to be built on the outer edge of town (probably on the west end), but still within the city limits of Alamogordo. In addition to the new hospital, plans are also in place to build a physicians' office complex in order to have a central location for medical services. GCMH is coordinating with Holloman AFB to explore ways to incorporate the medical services of the military with the new hospital and physicians plaza complex. It is anticipated that the new hospital would be completed about the year 2001 (Randall, 1996). The Alamogordo city commission unanimously agreed to issue $17.5 million of industrial revenue bonds in support of the Gerald Champion Memorial Hospital. The commission previously (March 1997) approved the needed property rezoning. The Air Force has endorsed a plan to merge the hospital at Holloman AFB with this new facility.

The German government has an agreement with the U.S. that German military and dependents can be treated at U.S. military medical facilities. Only if the treatment is beyond the capabilities of a base doctor would a GAF airman be sent off-base for medical care. Family members of GAF military personnel are allowed to go to Holloman AFB doctors. However, there are not enough doctors on-base to adequately handle the medical requirements of the families. Therefore, most of the military dependents go to doctors in Alamogordo. The GAF civilian personnel also go to community doctors (Olesen, 1996).

3.9.7 Public Finance

This section presents a short summary of local government finances, with an emphasis on Alamogordo and Otero County. Tax receipts represent a relatively small share of local governments' total general revenues, especially in New Mexico (Appendix G, Table G.2.6-1). Tax receipts accounted for 31.43 percent of total revenues in Alamogordo in FY90-91, which was lower than the share reported for the average local government in the U.S. in 1986-87 (38.46 percent). The ROI share is lower; tax receipts accounted for 24.07 percent of general revenues in the three-county region, and only contributed 14.52 percent to total general revenues in Otero County.

Otero County's estimated per capita expenditure level was $241 in 1996. Assuming that Alamogordo population was approximately 30,000 in 1996, the city's per capita expenditure level was $1,303.

Property Tax. In New Mexico, an ad valorem tax is assessed at the county level, calculated at 33.33 percent of all tangible personal and real property. Business personal property (e.g., computers, office furniture, shop equipment) is taxed as personal property. The personal property held by individuals in their homes is not taxed. In Alamogordo, the residential property tax rate per $1,000 of taxable value is 0.019711; the nonresidential rate is 0.03322. In Otero County (outside the city limits of any incorporated area), the residential rate is higher than in Alamogordo (0.02675/$1,000 taxable property), and the nonresidential rate is lower than in Alamogordo (0.023151/$1,000 taxable property). The most common method of estimating taxes is the effective tax rate, which gives an average approximation of tax levels. In Alamogordo, the effective property tax rate is 0.88 percent (OCEDC, 1996).

Gross Receipts Tax. The local gross receipts or sales tax is different for the county and for the cities within the county, depending upon the amount assessed above the state's basic rate of five percent. The gross receipts tax is imposed on the sale of most goods and services as well as leases of tangible personal property. The gross receipts tax rate in Alamogordo is 6.1875 percent and 5.625 percent in Otero County (OCEDC, 1996).

Personal Income Tax. New Mexico levies a tax on the net income of every resident or nonresident employed or doing business in the state. Depending upon net income, marginal rates range from 2.4 percent to 8.5 percent (OCEDC, 1996).

Incentives for Businesses. Alamogordo and Otero County have a number of incentives to attract new businesses into the area. These incentives include tax abatements (property tax abatements and compensating tax abatements), state and Federal investment credits (New Mexico investment credit, Federal Sales Corporations tax incentive, and Watts & 800 tax exemption), New Mexico and Federal loan/grant programs (Enchantment Land Certified Development Company, New Mexico severance tax loan program, and community development block grants), corporate income tax-double weighting the sales factor, and other incentives (including employment assistance, employee training, access to local and state government, and technology transfer) (OCEDC, 1996).

3.9.8 Low-Income and Minority Populations — Environmental Justice

Executive Order 12898, *Environmental Justice*, was issued by the President on February 11, 1994. Objectives of the Executive Order as it pertains to this document include identification of low-income and minority populations potentially impacted by proposed Federal actions. Accompanying Executive Order 12898 was a Presidential Transmittal Memorandum which referenced existing Federal statutes and regulations to be used in conjunction with Executive Order 12898. One of the items in this memorandum delineated the use of NEPA policies and procedures.

Specifically, the memorandum indicates that, "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities, low-income communities, when such analysis is required by the NEPA 42 U.S.C. Section 4321 et. seq."

The information provided in this section identifies minority populations and low-income populations that could be impacted by the proposed action and alternatives. Section 4.9 addresses whether the proposed action and alternatives would have a disproportionately high and adverse impact on minority populations and low-income populations. The potentially affected area includes Holloman AFB, areas affected by range operations, and geographic areas underlying the MTRs, Restricted Areas, and MOAs which would be affected by the beddown. These areas are located in 27 counties in southern New Mexico, west Texas, and a small portion of eastern Arizona.

Information contained in the *1990 Census of Population and Housing* was used to identify low-income and minority populations in potentially affected locations. The Bureau of the Census reports race and ethnicity, which together are used to calculate the minority population, and it reports poverty status.

- *Minority populations* are defined as: Black; American Indian; Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or other.

- *Poverty status* (used in this EIS to define *low-income* status) is defined as families living below poverty level ($12,764 for a family of four in 1989, as reported in the *1990 Census of Population and Housing*).

Based upon the *1990 Census of Population and Housing*, the 27-county area contained a total population of 658,302 including 170,172 families. Of this total, 341,795 persons, or 51.9 percent, were minority and 35,788 families, or 21.0, percent were low-income.

Appendix Table G.2.7-1 identifies census tracts and block numbering areas (BNAs) underlying the military airspace that could be affected by the project. (For reporting purposes, the Bureau of Census delineates census tracts in metropolitan areas and densely populated counties, and delineates BNAs in non-metropolitan counties where no census tracts have been identified.) Table G.2.7-1 reports information on total population, minority population, and low-income population for each of the 82 tracts/BNAs located under the airspace. It also includes similar information for just those portions of each tract that underly the military airspace. MTRs and MOAs that would be utilized for proposed training activities (under any of the training options being considered) overlie 82 different census tracts/BNAs in 27 counties in New Mexico, Texas, and Arizona. In 36 of the 82 tracts/BNAs, the minority population is greater than 50.0 percent. In 39 of the 82 tracts/BNAs, the percentage of families living below the poverty level is greater than 20 percent.

The number of persons living in the portion of each tract/BNA that falls under the MTR corridors and MOAs was estimated by multiplying the affected land area by the population density and then weighting the density according to the proportions of minority and low-income populations. The total estimated population living under the airspace numbers 111,606 persons. Approximately 47,779 persons living under the airspace are members of minority populations. This represents 43 percent of the potentially affected population living under the airspace. Approximately 6,166 families living under the airspace are living below the poverty level. This represents 20 percent of the potentially affected population.

3.10 TRANSPORTATION

The evaluation of the existing roadway conditions is based on the estimation of capacity (Transportation Research Board, 1994). The traffic demand, or traffic volume[1], is compared to the capacity[2] to estimate how well the roadway is functioning in serving traffic. Capacity is stated in terms of vehicles per hour (vph), and is the maximum number of vehicles that can be effectively processed by a segment of roadway or intersection during one hour. The peak hour volume (PHV) is the amount of traffic that occurs in the typical peak hour.

Volume-to-capacity ratios (V/C) are used as a basis for determining level of service (LOS) ranges (Table 3.10-1). Based on highway capacity analysis, the performance of a given roadway segment is defined at one of the following levels of the LOS scale.

<u>Good Operating Conditions</u>

- A - Free-flowing operations.
- B - Stable flow and speeds are generally maintained.
- C - Stable flow, but freedom to maneuver is noticeably restricted.

<u>Below Average</u>

- D - High density, but stable, flow; speed and freedom to maneuver are severely restricted.

<u>Unacceptable</u>

- E - Unstable flow; operating conditions are at capacity.
- F - Forced breakdown in vehicular flow with traffic demand exceeding capacity.

[1] Traffic volumes are typically reported as Annual Average Daily Traffic (AADT), which is the daily number of total vehicles (passenger cars plus trucks) averaged over an entire year.

[2] The capacity of a roadway depends on many factors, including number of lanes, lateral obstructions, truck percentage of the traffic stream, intersection control, and other physical factors, depending on the type of roadway. The capacity of a two-lane highway is determined for both directions combined; the capacity of a divided highway is determined for one direction.

Table 3.10-1. Roadway Levels of Service

LOS	Freeways		Signalized Intersections		Two-Lane Highways[a]	
	Max. V/C	Avg. Speed	Max. V/C[b]	Max. Delay (sec./vehicle)	Max. V/C[c]	Avg. Speed
A	0.32	60 mph	0.50	5.0	0.10	57 mph
B	0.50	60 mph	0.65	15.0	0.23	54 mph
C	0.75	60 mph	0.85	25.0	0.39	51 mph
D	0.90	57 mph	0.95	40.0	0.57	49 mph
E	1.00	53 mph	1.00	60.0	0.94	40 mph
F	>1.00	30 mph[d]	>1.00	>60.0	—	<40 mph

LOS - Level of Service

V/C = volume/capacity ratio

[a] For free flow speeds of 60 mph

[b] Maximum V/C ratios for critical lane groups (i.e., most constrained by the signal timing).

[c] Rolling terrain, 20 percent no passing.

[d] Speeds for LOS F are highly variable. 30 mph is a rough approximation.

3.10.1 FY95 Conditions

Existing roads and highways within the ROI are described at two levels: (1) regional, representing the major links within the Alamogordo area (Figure 3.10-1), and (2) local, representing community roads (Figure 3.10-2).

Regional. The region surrounding Holloman AFB is served by a network of state and county highways. Holloman AFB is located 10 miles southwest of Alamogordo, New Mexico on U.S. 70, and immediately north of White Sands National Monument. Alamogordo is the major population center in this region, and U.S. 70 provides regional access to Las Cruces, New Mexico, located 50 miles to the southwest. Just south of Alamogordo, U.S. 70 merges with U.S. 54, which provides access to El Paso, Texas. Just north of Alamogordo, U.S. 82 intersects U.S. 54/U.S. 70 and goes east through Artesia, New Mexico. U.S. 54/U.S. 70 splits just north of the junction with U.S. 82 in Tularosa, New Mexico; U.S. 70 goes northeast through Ruidoso, New Mexico, and U.S. 54 provides access to northern New Mexico. In Las Cruces, U.S. 70 intersects with Interstate 25, a major north/south route providing access to Albuquerque, New Mexico, El Paso, and Interstate 10.

Local. Figure 3.10-2 identifies the general local road network now in place and projected to be in place in the immediate vicinity of Holloman AFB. (The planned "Alamogordo Relief Route", which would be in place by the time the proposed action would be implemented in FY00, is also shown.) Presently, the major north/south roadway through Alamogordo is White Sands Boulevard (U.S. 54/U.S. 70), which extends 5.3 miles from U.S. 82 south to the junction of U.S. 54 and U.S. 70. White Sands Boulevard passes through the Alamogordo business district, and carries the heaviest volume of traffic. The major collector streets providing access to the rest of the city are 1st Street, 10th Street, and Indian Wells Road. Each of these roads has a signalized intersection with White Sands Boulevard.

The main gate to Holloman AFB is located on U.S. 70 approximately 10 miles west of U.S. 54. Gate counts show that approximately 1,570 vehicles enter the main gate on First Street during the morning peak hour.[1] The AADT on U.S. 70 between themain gate and U.S. 54 is 20,427. South of the main gate on U.S. 70 is the west gate, located at the intersection of U.S. 70 and West Gate Avenue. Traffic counts show that approximately 460 vehicles access the west gate during the morning peak hour. The AADT on U.S. 70 at this intersection is 4,952. The La Luz gate is located on Vandergrift Road and provides service for base personnel who live in the La Luz area.

The major road on McGregor Range is State Road 506, which crosses the northern area of the range in an east-west direction. This road provides access to McGregor Range on the west at U.S. 54, travels east where it intersects with County Road FO52, and continues northeast until it exits the range. State Road 506 is a gravel road maintained by Otero County, and primarily serves as access to Timberon and Piñon,

[1] A growth factor of 1.4 percent per year was applied to traffic counts reported in: *Holloman Air Force Base Traffic Engineering Study* (Daniel Consultants, Inc., 1994).

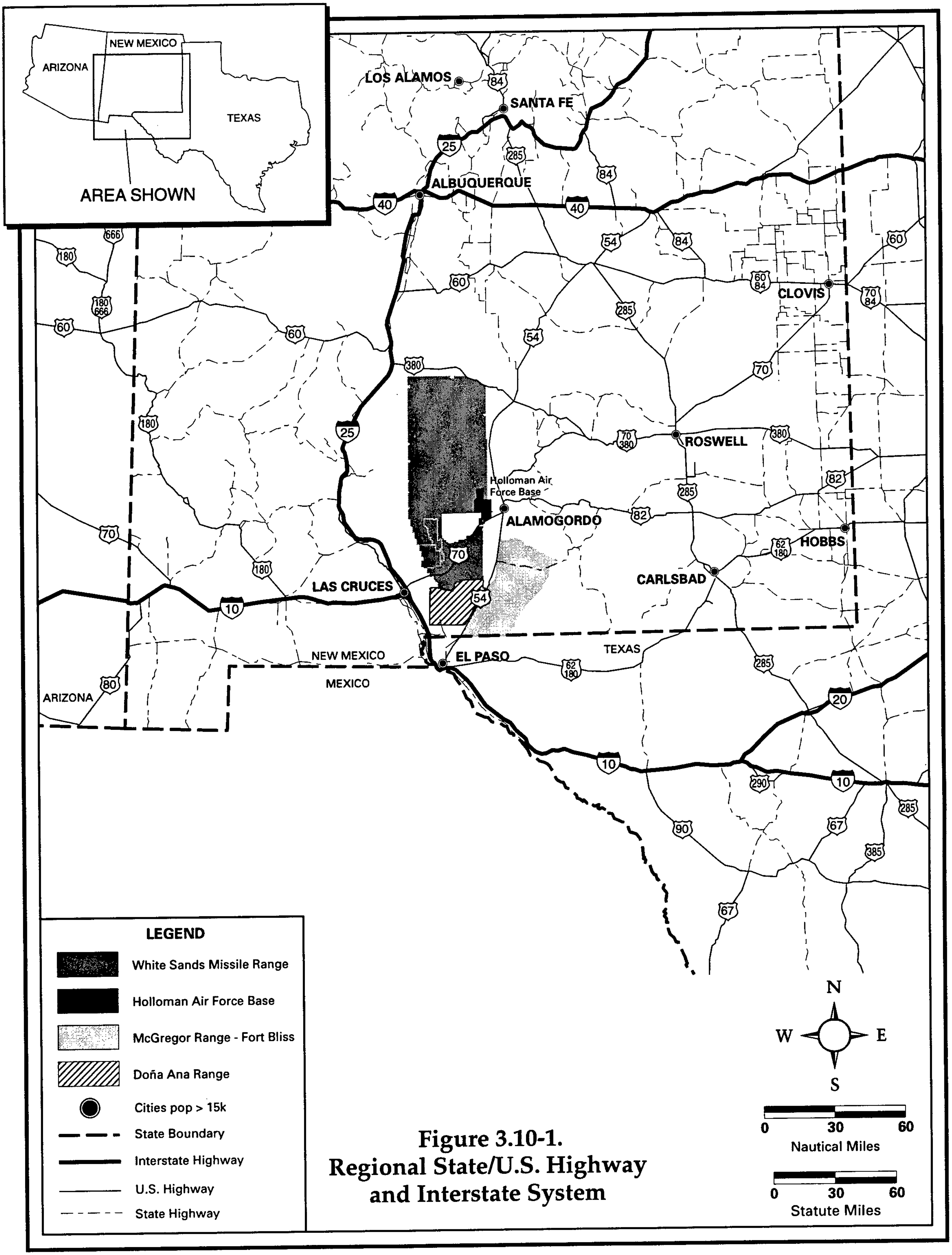

Figure 3.10-1.
Regional State/U.S. Highway and Interstate System

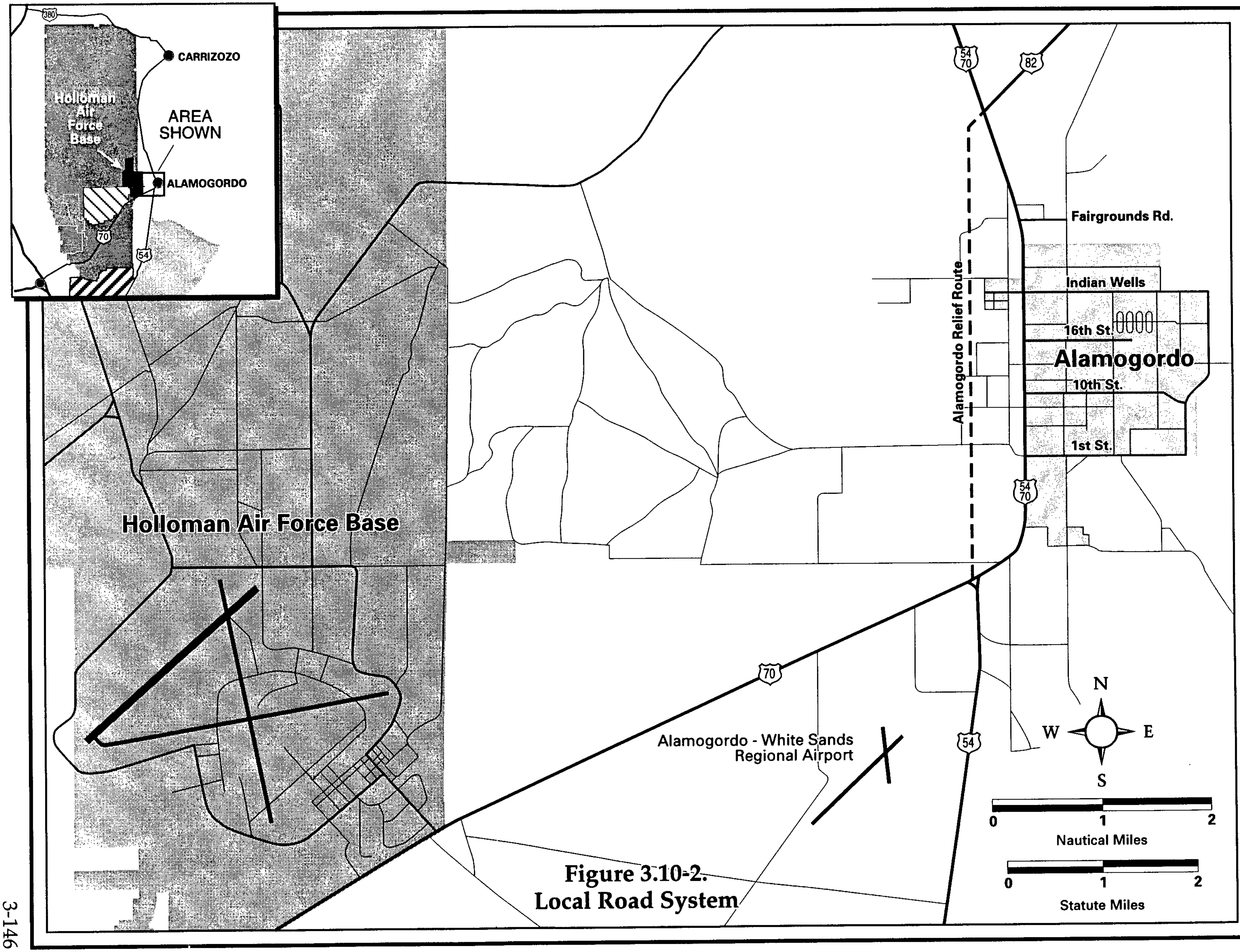

Figure 3.10-2.
Local Road System

New Mexico, but also serves Dell City, Texas. The annual average daily traffic volume (AADT) on State Road 506 was less than 30 vehicles per day in 1995. Current operations on the range require State Road 506 to be closed occasionally for safety reasons. The road-closing schedule is provided to Otero County and is available to the public in order to alleviate unnecessary delays. Three guard stations on State Road 506 are used to close the road when necessary: one is located at the intersection with U.S. 54; the second is at the intersection with FO52; the third is on the east end of the range at County Road EO1. A fourth guard station on FO52 at the boundary of the range south of the intersection with State Road 506 is also used to close off access. Other Otero County roads in the northeast area of the range or to the east of the range include: FO34, FO35, FO37, FO50, FO51, and FO67. If needed, access to these roads can be guarded to control their use as well. There are numerous other roads in this vicinity and on the range that are not maintained by Otero County or the BLM. These are primarily dirt roads that provide access to much of the BLM land in the area. The BLM does not, however, own or maintain any roads.

Capacity Analysis. Capacity analyses were conducted on the surrounding roadways. The established PHV, capacities, and LOS on key community roadways in 1995 are shown in Table 3.10-2. The segment of roadway with the most congestion is the section of U.S. 54/U.S. 70 between 1st Street and Indian Wells Road; the AADT is 29,400 and this four-lane section operates at LOS D during the peak hour. All other roadways within the ROI operate at LOS C or better.

3.10.2 Projected Baseline FY00 Conditions

Expected changes in population in the Alamogordo area, due both to normal population growth and to recently implemented changes in personnel at Holloman AFB (i.e., associated with the AT-38 drawdown) are expected to result in changes in traffic in the Alamogordo area by the time the proposed action would be implemented. Table 3.10-2 shows the effect of these changes on PHV and LOS for key community roadways.

The New Mexico State Highway Department will construct a four-lane, access-controlled bypass route approximately one-half mile west of, and parallel to, White Sands Boulevard (Rael, 1998). The south end of the route is planned for the intersection of U.S. 54 and U.S. 70; the north end will intersect U.S. 54/U.S. 70 at U.S. 82. The purpose of this roadway is to provide an alternate route and relieve the traffic congestion on White Sands Boulevard through the downtown area. This project will be constructed in two phases. The first phase, from U.S. 54 / U.S. 70 to 1st Street, is scheduled to begin construction in June, 1998 with a construction period of 12 to 20 months. The schedule for the second phase (currently unfunded), from 1st Street to the intersection of U.S. 54/U.S. 70 with U.S. 82, could begin as early as the fall of 1998. For the purposes of the traffic analysis, it is assumed that both phases of the Alamogordo Relief Route project will be completed in FY00 (Hunt, 1998).

Table 3.10-2. Peak Hour Volumes and Level of Service

Roadway	Segment	Highway Type	Capacity (vph)	FY95 Conditions			FY00 Projected Baseline		
				AADT	PHV (vph)	LOS	AADT	PHV (vph)	LOS
U.S. 54	South of U.S. 70	2-Lane	2,426	4,299	546	B	4,550	578	C
U.S. 70	West of Holloman AFB (Main Gate)	Divided	2,650	4,952	328	A	5,301	351	A
U.S. 70	Holloman AFB (Main Gate) to U.S. 54	Divided	3,975	20,427	1,312	B	20,995	1,349	B
U.S. 54/U.S. 70	U.S. 54/U.S. 70 Junction to lst Street	Divided	3,280	37,045	2,370	C	23,573	1,508	A
U.S. 54/U.S. 70	lst Street to Indian Wells Road	Divided	2,460	29,400	2,145	D	17,784	1,297	B
U.S. 54/U.S. 70	Indian Wells Road to Fairgrounds Road	Divided	2,460	24,364	1,548	B	13,970	888	A
U.S. 54/U.S. 70	Fairgrounds Road to U.S. 82	Divided	2,460	18,083	1,153	A	9,214	588	A
U.S. 54/U.S. 70	U.S. 82 to U.S. 54/U.S. 70 Junction (Tularosa)	Divided	2,650	12,079	813	A	12,832	864	B
U.S. 70	East of U.S. 54 (Tularosa)	Divided	1,773	5,104	337	A	5,413	358	A
U.S. 54	North of U.S. 70 (Tularosa)	2-Lane	1,436	1,773	225	B	1,842	234	B
U.S. 82	East of U.S. 54 (2 miles)	2-Lane	2,000	4,023	511	C	4,254	540	C
Relief Route	Entire route	Divided	4,220	N/A	N/A	N/A	13,933	885	A

Notes: Rolling terrain, 20 percent no passing, 50-50 directional split used in determining capacity of 2-lane segments.
AADT = Annual Average Daily Traffic
LOS = Level of Service
PHV = peak hour volume
vph = vehicles per hour

A growth rate of 1.4 percent per year was applied to the FY95 AADT values for U.S. 54, U.S. 70, and U.S. 82. The AADT values for White Sands Boulevard (U.S. 54 / U.S. 70) were derived from year 2020 projections provided by the New Mexico State Highway and Transportation Department (NMSHTD). The Alamogordo Relief Route will be responsible for a decrease of 4,800 vehicles per day, from FY95 figures, on White Sands Boulevard by the year 2020. This decrease, along with a 1.4 percent deduction per year, was used to establish the estimated AADT on each segment of White Sands Boulevard for FY00 baseline. The projected year 2020 AADT for theAlamogordo Relief Route was also provided by the NMSHTD. Based on this projection, the AADT on the Relief Route will be approximately 13,933 in FY00. All roadways in the ROI will operate at LOS C or better in FY00.

The NMSHTD is currently installing traffic signals at the following intersections on U.S. 70 in Alamogordo: Panorama Boulevard, Walker Road, and Airport Road. This project is scheduled to be completed in March, 1998.

3.11 UTILITIES

This section provides a description of the water supply, wastewater treatment, solid waste, electricity usage, natural gas consumption, and system capacities at Holloman AFB and in the study area (defined by the area served by utility systems providing service to Holloman AFB and the City of Alamogordo).

3.11.1 FY95 Conditions

Water Supply. A total of 16 public water supply systems are located within the Tularosa Basin with service populations ranging from 36 to 30,000 persons (Livingston Associates, 1997). A total population of almost 44,000 is currently on a public water supply. Approximately 63 percent of the public water supply diversions are from surface water, and 37 percent from groundwater. The City of Alamogordo and Holloman AFB are the largest public water supply providers in the Basin.

The average water use in the Tularosa Basin is 118 gallons per capita per day (gpcd). Typically, the amount of landscape irrigation increases per capita demand by as much as 100 percent of the typical domestic use. Additionally, in larger systems where there is large commercial, industrial, or public use (e.g., parks), the non-domestic uses are averaged into the population demand figures. Thus, city per capita water demand rates are higher than their rural counterparts. This applies to military facilities such as Holloman AFB, where on-base amenities and public uses are distributed over the full-time resident population.

Using 1995 data supplied by the New Mexico State Engineer Office, the City of Alamogordo Public Water Supply System (PWS) services a baseline population of 30,136. Average demand is 245 gpcd. In 1995, 8,262.5 acre-feet (AF) was diverted into the City of Alamogordo system. Approximately 80 percent of potable water supply originated from surface water diversions, and approximately 20 percent derived from wells (groundwater).

Potable water is supplied to Alamogordo through a water supply system that uses both ground and surface water resources to meet average daily demands that vary from 5.5 million gallons per day (mgd) in the winter to 9.5 mgd in the summer. Peak summer demands of 10.8 mgd have been adequately met by this system. The city obtains groundwater from six wells that provide approximately 4.65 mgd, with two wells (Nos. 6 and 7) providing 65 percent of the supply. The city obtains surface water from springs in the Sacramento Mountains and from Bonito Lake, an impoundment of the Rio Bonito, also located in the Sacramento Mountains. These waters are stored in three large aboveground reservoirs (two with a 40 million gallon capacity and one with a 100 million gallon capacity). This water goes to the Alamogordo treatment plant prior to its distribution to city residents and Holloman AFB. The city's water treatment plant consists of rapid sand filtration and chlorination, and the system has a 10 mgd capacity.

Surface water from Bonito Lake is transported in the 22-inch diameter, 76-mile long Bonito pipeline built by the U.S. Air Force. The Bonito pipeline, originating at Bonito Lake, delivers water from the Pecos Basin to Alamogordo and subsequently to Holloman AFB and White Sands National Monument. The amount delivered is a significant portion of that used by Holloman AFB and White Sands National Monument would also continue to use other water sources outside the Tularosa Basin, including water from Bonito Lake. Maintenance of the pipeline and water rights from the lake are shared by Holloman AFB and Alamogordo. This pipeline, operating since 1957, was taken out of service from 1994 to 1996. The pipeline was returned to regular service in April 1997 and is currently delivering, at above 90 percent of its capacity, to the city's reservoirs for use by Alamogordo and Holloman AFB.

The city enacted a water conservation ordinance in 1996 in response to a lack of rainfall and the lack of supply from the Bonito pipeline. The program focused on restricting irrigation to specific times and days based on street addresses. Wastewater effluent is being used at the golf course and parks and ballfields south of 1st Street. To supplement the existing water sources, the city is considering developing a new 2.0 mgd well and evaluating other spring sources that might produce 1.5 mgd.

Using the same 1995 baseline year, Holloman AFB serviced a baseline population of 5,547 (Livingston Associates, 1997). Average demand was 386 gpcd. In 1995, 2,397 AF of untreated water was diverted to the Holloman AFB utility system. Approximately 97 percent of potable water was derived from wells (groundwater).

Holloman AFB obtains its potable water supply from two water sources (one-third from the city of Alamogordo and two-thirds from groundwater wells). Surface water originating from Bonito Lake is received as deliveries through the City of Alamogordo system. Holloman AFB is provided credit for 50 percent of Bonito Lake water delivered through the Alamogordo system. Holloman AFB is required to pay a fee for deliveries from the City of Alamogordo exceeding the annual allotment. Water is obtained from the City of Alamogordo, in the October to April timeframe, and from five well fields: Boles, Frenchy (Dog Canyon), Escondido, Douglas, and San Andreas, located about 15 miles southeast of the base in alluvial

fans at the western base of the Sacramento Mountains. Fourteen wells have the capacity to provide approximately 7,043 gpm (10.0 mgd). The Tularosa Basin is considered a mined basin because well withdrawals are in excess of natural recharge or induced recharge from streams (New Mexico State Engineer Office, 1997). Early work by McLean (1970) suggested that this may become true for the portion of the groundwater basin under Alamogordo and Holloman AFB. Currently, Holloman AFB and Alamogordo are funding a USGS study to develop a regional water model to improve estimates of recharge specific to the groundwater basin in the immediate vicinity. This information will allow prudent management of the groundwater resources to ensure continued availability and water quality. Once the water enters the base, it is chlorinated by metered injection of chlorine gas and transported by six- and eight-inch distribution lines. Water use within the base currently consists of domestic use, industrial uses, storage for fire protection, and irrigation. Water consumption in 1995 was approximately 2.14 mgd and equaled 2.89 mgd in 1996. The increase in 1996 is attributed to various leaks that have been repaired.

Military construction funds have been requested for replacement of the Bonito pipeline, which may be achieved through cost-sharing with the City of Alamogordo. The base and city are currently studying long-term solutions. The base is redrilling and redeveloping a well in the San Andreas well field to maintain production levels. Furthermore, the USGS is currently conducting seismic investigations in the Grapevine Canyon area for Holloman AFB, to determine the aquifer production and water quality characteristics of the local alluvial fan. The Grapevine Canyon alluvial fan, which is largely within McGregor Range, is less than two miles from the Holloman AFB pipeline from the Escondido well field. The Holloman AFB well field and McGregor Range boundary are contiguous at that point.

Total water demand must account for the volume of treated water returned to the hydrologic system (i.e., reclaimed water, referred to as return flows). In the case of the larger water systems, return flows may constitute a significant fraction of annual water demand. In 1995 (Livingston Associates, 1997), return flow for the City of Alamogordo PWS exceeded 4,100 acre-feet/year (AFY), approximately 50 percent of water imports. For the Holloman AFB system, return flow was measured at 959 AFY, approximately 40 percent of water imports.

Water supply on McGregor Range is limited to a distribution system at the range camp and a transmission pipeline and stock watering tank system on Otero Mesa. Potable water is supplied to the McGregor/Meyer Range Camp from the City of El Paso's system. The pipeline system transports untreated water from the Sacramento Mountains to a series of stock watering tanks. The U.S. Army has rights to 0.11 mgd from this source and provides the supply to support grazing and wildlife.

Wastewater. The City of Alamogordo operates a 4.0 mgd capacity extended aeration wastewater treatment plant. Average flows in 1996 were 3.0 mgd. Currently, the city disposes of its entire wastewater effluent through reuse on parks, golf courses, and other irrigated areas. Sludge from the wastewater system is placed in sludge drying beds and reused or disposed of in accordance with state and Federal regulations. The

city is also currently taking efforts to improve the sewer system with the replacement of the existing collection system.

Holloman AFB began operation of a new on-base wastewater treatment plant in July 1996. The plant has an extended aeration activated sludge design with a design flow capacity of 1.5 mgd. The new treatment system consists of preliminary screening, biological chlorine disinfectant treatment and removal, aerobic sludge digestion, and sludge dewatering and drying. The NPDES permit application for the discharge was submitted in December 1995 and is under consideration by EPA Region VI. The discharge plan for the new wastewater treatment plant has been approved by the State. This plan covered discharges to constructed wetlands, golf course irrigation, and sludge drying beds. Average daily flow for the new plant has been 1.16 mgd. In order to plan for industrial wastewater from existing and future operations, the base is conducting a survey of industrial discharges to the base wastewater system. Results of this survey will be used to develop methods to handle industrial discharges.

The on-base sewage collection system has groundwater infiltration problems due to the high saline water table. Recent projects have replaced sewer lines in the base housing area and elsewhere on-base, reducing the infiltration and decreasing the flow to the wastewater treatment plant. Less than 10 percent of the base facilities, which are not connected to the sewer system, operate septic tanks and/or leach fields.

Solid Waste. Solid wastes generated in the City of Alamogordo are disposed of in the Otero-Lincoln County Regional Landfill. The landfill was established by a commission that includes Otero and Lincoln counties, and the cities of Alamogordo, Tularosa, Ruidoso, and Cloudcroft. The 80-acre permitted landfill is located 24 miles south of Alamogordo and is operated by the City of Alamogordo. In 1996, the landfill accepted 187.8 tons/day, with approximately 110.75 tons/day from the City of Alamogordo. Current waste flows have used about two acres per year. At this rate, the lifespan of the landfill will be 40 years. The landfill is also permitted to receive asbestos wastes.

Solid wastes generated by Holloman AFB are collected by a contract waste hauler and disposed of at the Otero-Lincoln County Regional Landfill. In 1996, an average of 12.72 tons/day was hauled to the landfill. The base has established an extensive recycling program to meet its ACC-established recycling goals. In 1997, this decreased to 11.98 tons/day, which corresponds to a six percent increase. In 1996, the base recycled approximately 3.28 tons/day of ferrous metals, cardboard, high-grade paper, newspaper, steel and aluminum cans, glass, and plastics. In 1997, recycling yielded 2.33 tons/day; thus, recycling decreased at the same time as the landfill volume decreased. Recycling, which was contracted as of September 1997, includes curbside pickup of recyclable materials in military family housing and pickups at recycling collection stations located throughout the industrial area. A composting program for tree trimmings, scrap lumber, and yard waste has been developed.

On-base landfills for domestic and industrial waste and asbestos have been closed. Construction and debris wastes from ongoing projects are reused as possible or disposed of as solid waste by the contractor. Clean, segregated brush and lumber can be taken to the recycling center.

Electricity. Electricity is supplied to Alamogordo/Tularosa by the Texas-New Mexico Power Company (TNP). TNP provides electricity to three regions of the Southwest. In the New Mexico region, TNP serves 43,000 customers in nine communities. TNP has over 17,000 customers in the Alamogordo-Tularosa area, with an annual consumption exceeding 192,295 million kilowatt hours (kWh).

Otero County Electric Transmission Cooperative serves the rural areas of Otero, Lincoln, and Chaves counties. In 1996, Otero County Electric Cooperative served 12,977 customers, with supplies purchased from the Plains Generating and Transmission Cooperative in Albuquerque, New Mexico. Otero Electric purchased 107 million kWh in 1996; peak demand was 119.64 megawatts (MW). Average annual residential use for customers of Otero County Electric Cooperative was 4,800 kWh. The Otero distribution system is not government-owned and serves approximately 600 military family housing units on-base, plus the following outlying sites: NEXTRAD, Benson Ridge, and Douglas well field.

El Paso Electric Company provides power to southern New Mexico, including Holloman AFB, and the City of El Paso, Texas. In 1994, the last year of available data, El Paso Electric had a record peak demand of 1,365 MW and a total increase in sales of 2.2 percent. El Paso Electric sold 8,069,674 kWh in 1994 and had an average residential use of 6,299 kWh. In 1994, the base consumed 83,300,000 kWh and 80,760,000 kWh in 1995.

Holloman AFB has a contract with El Paso Electric to provide service through the year 2005 through a 115 kV switching station located near the main gate. The El Paso Electric 115 kV line is run to three 115 kV/13.2 kV substations on the base. Peak electrical usage on the base is 21 megavolt amperes (MVA), with the total capacity equaling 22.5 MVA. The main and north substations are presently capable of providing power to the entire base.

Natural Gas. The City of Alamogordo receives natural gas from the Public Service Company of New Mexico (PNM) Gas Services Division. Natural gas consumption in the city is estimated to equal 710,190 thousand cubic feet (mcf). Holloman AFB purchases gas from a Defense Fuels Supply Center (DFSC) contracted supplier. The DFSC supplier is responsible for supplying gas through El Paso Natural Gas' pipeline. PNM Gas Services is the Holloman AFB contracted local distribution company responsible for taking the gas from the El Paso Natural Gas pipeline and getting it to the base. In FY95, the base purchased 392,997 mcf.

For the base, the gas lines are looped in a continuous system to provide service to the main area, the west area, and the north area. The base receives natural gas from PNM Gas Services near U.S. 54. The pipe serving the base has a mainline pressure of 45 pounds per square inch (psi).

3.11.2 Projected Baseline FY00 Conditions

Water Supply. A 40-year projection for potable water demand for the Alamogordo and Holloman AFB systems has been reported (Livingston Associates, 1997). These estimates were based on the following assumptions: (1) per capita demand remains constant, (2) conservation measures are not implemented, and (3) recycling and reuse of underused resources (e.g., wastewater) is not factored into per capita demand. In regard to the City of Alamogordo PWS, population for the year 2040 is projected at approximately 48,000 individuals, while demand remains static at 245 gpcd. Total water demand is thereby projected to approximate 13,000 AFY. For the Holloman AFB system, population for the year 2040 is projected at approximately 5,250 individuals, while demand remains static at 386 gpcd. This would require delivery of approximately 2,500 AFY. Using these baseline conditions and population projections (Livingston Associates, 1997), Holloman AFB water demand will remain substantially static in FY00 and through the year 2040. Population adjustments associated with relocation of GAF personnel, dependents, and support personnel are within the projected assumptions (Livingston Associates, 1997) and therefore are not expected to substantially modify 2040 baseline population estimates, either at Holloman AFB or in Alamogordo.

Potable water requirements in the City of Alamogordo are anticipated to equal 7.7 mgd for the overall regional population. The existing potable water system currently meets average daily demands ranging from 5.5 to 9.5 mgd and is able to meet peak requirements of 10.8 mgd. An additional well and other spring sources are already being considered by the city to supplement the existing supply. Water conservation measures such as those developed in 1996 may be useful in meeting peak summer demands caused by irrigation practices. Potable water requirements at Holloman AFB are expected to equal 2.14 mgd in FY00. The base has the capacity to meet demands up to 10.0 mgd and has adequate capacity to meet these requirements.

Wastewater. Wastewater flows to the City of Alamogordo's treatment plant are estimated to equal 3.1 mgd in FY00. The city's plant has the capacity to provide treatment to 4.0 mgd and will be able to process the anticipated flow. Wastewater flows to the base's treatment plant are projected to equal 1.15 mgd in FY00. Base projects that reduce infiltration to the sewer lines and implement water conservation will help reduce the flows processed by the plant. With the capacity to process 1.5 mgd, the base's treatment plant will be able to handle the expected wastewater flows.

Solid Waste. Solid waste disposed of at the Otero-Lincoln County Regional Landfill is projected to equal 198 tons/day in FY00. The landfill had a projected lifespan of 40 years when it was opened in 1994. Solid waste disposal at Holloman AFB destined for landfill, based on 1997 values and a projected six percent reduction by FY00, would amount to approximately 11.9 tons/day. In FY00, recycling and composting will decrease the total amount disposed of at the landfill by approximately 3.0 tons/day.

Electricity. Consumption of electricity within Alamogordo/Tularosa is projected to increase to 220,290 million kWh by FY00. TNP provides service to over 18,500 residential customers and would be able to provide service without any interruptions. Electrical consumption at Holloman AFB is projected to equal 86,214,000 kWh in FY00. Adequate capacity is available from the main and north substations to meet this requirement.

Natural Gas. Natural gas consumption within the City of Alamogordo is projected to increase to 768,730 mcf by FY00. PNM provides service to over 11,700 residential customers and has indicated that they would be able to meet daily and peak demands without any interruptions. Natural gas consumption at Holloman AFB is projected to equal 1,033 mcf/day in FY00. Adequate capacity is available to meet this requirement.

3.12 SOILS

3.12.1 FY95 Conditions

Holloman AFB. The soils at and near Holloman AFB contain large amounts of gypsum (USDA, 1981). These gypsum-bearing soils are mostly shallow to deep and well-drained. Many of the gypsum soils have low strength and are very corrosive to underground utility lines and pipes. The erosion potential of these soils is very high, especially where misuse has allowed shrubs to replace grasses and where vegetation has been removed. During heavy storms, flood waters can quickly erode the disturbed gypsum-bearing soils, forming steep-sided ravines.

McGregor Range. Twelve major soil associations are recognized on McGregor Range (Figure 3.12.1[1] and Table 3.12-1). These associations consist generally of silty, sandy, and gravelly loams, and fine sands and silts. The soils are calcareous and alkaline, having developed from the weathering of gypsum, limestone, sandstone, and igneous and metamorphic rocks. Wind-blown sediments from exposed lakebeds occur widely. The soils range from moderately well-drained to very poorly drained in areas where indurated calcium carbonate (caliche) occurs. Soil thickness ranges from a few inches on slopes and near bedrock to more than five feet in some valleys.

As indicated in Table 3.12-1, the erosion potential of some soils on McGregor Range is high to severe. These soils are particularly prone to erosion if disturbed. In addition, many of the silt-bearing soils in drainages and along the edges of alluvial fans have a very low capacity to support weight (low load-bearing strength). The fine silts in these soils tend not to bind together or become compacted when dry. Consequently, vehicles traveling across these soils (especially heavy military

[1] The boundaries between the soil associations shown in Figure 3.12-1 and the characteristics of soils within these associations are approximations only. Site-specific soil conditions could be substantially different than indicated in Figure 3.12-1. The U.S. Department of Agriculture is currently conducting a detailed soil survey of McGregor Range, which is expected to be completed by 2001.

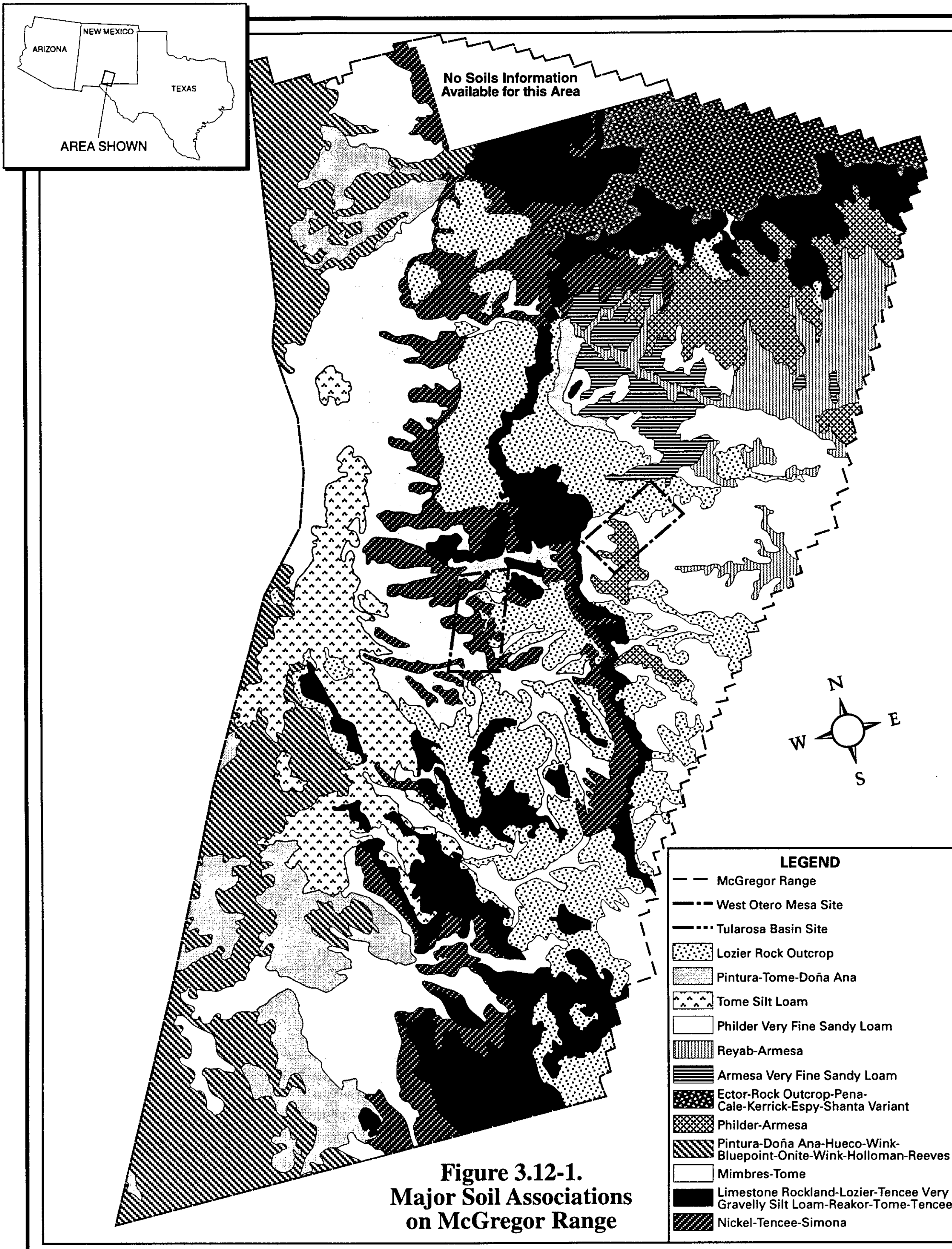

Figure 3.12-1. Major Soil Associations on McGregor Range

Table 3.12-1. Major Soil Associations on McGregor Range (Arranged According to Erodibility)

Map Unit/Units (see Figure 3.12-1)	Areal Extent	Slope (%)	Soil Description	Erodibility (Water/Wind)
Pintura-Tome-Doña	57 mi^2	0-5	Loamy fine calcareous sands; very fine sands	Severe/High
Limestone Rockland-Lozier	141 mi^2	20-65	Very gravelly loam; limestone bedrock	High/Low
also includes:				
• Tencee	4 mi2	0-10	Very gravelly silt loam	Low/Mod
• Reakor-Tome-Tencee	2mi2	0-2	Silt loam; very gravelly sand loam	Low/Mod
Tome silt loam	64 mi^2	0-5	Calcareous silty loam	High/High
Armesa	22 mi^2	0-5	Very fine sandy loam	High/High
Lozier Rock Outcrop	155 mi^2	5-20	Gravelly loam; limestone bedrock	Moderate to High/Low
Ector-Rock Outcrop	42 mi^2	20-50	Gravelly loam; limestone bedrock	Moderate to High/Low
also includes:				
• Pena-Cale-Kerrick	1 mi2	0-2		Low/Moderate
• Espey-Shanta variant	<1 mi2	0-2		Low
Nickel-Tencee-Simona	101 mi^2	40-60	Gravelly, very fine sandy loam; very gravelly silt loam	Moderate/Low
Mimbres-Tome	166 mi^2	0-2	Silt loam	Low to moderate/ moderate
Pintura-Doña Ana-Hueco-Wink	131 mi^2	0-5	Loamy fine sand; sandy loam	Low to Moderate/High
also includes:				
• Bluepoint-Onite-Wink	3 mi2	0-2	Loamy fine sand; loam sand	Severe
• Holloman-Reeves	2 mi2	0-2	Very fine sandy loam; silty loam	Moderate
Philder	78 mi^2	0-9	Very fine sandy loam	Low to Moderate/High
Reyab-Armesa	30 mi^2	0-2	Very fine sandy loam; loam	Low to Moderate/High
Philder-Armesa	43 mi^2	0-5	Very fine sandy loam	Low/High

Source: U.S. Army Corps of Engineers (USACE), 1994; U.S. Department of Agriculture (USDA), 1981.

vehicles) can quickly bog down in the loose dry silt. To avoid these impassable areas, vehicles created adjacent roads, although these too have become impassable. In places on the range, the remnants of two or three older roads are plainly visible adjacent to existing dirt roads.

In addition to directly disturbing soils, parts of some roads leading up to Otero Mesa have altered drainages in areas where soils are particularly vulnerable to erosion. In places, headward erosion has cut six-foot deep gullies adjacent to and across road surfaces, thereby making roads impassable (U.S. Army, 1996b). Headward erosion on road surfaces can also capture local drainages, thereby increasing the volume of storm water that flows in the newly formed gully and decreasing seasonal runoff in natural drainages.

The West Otero Mesa site is grazed by cattle. This activity has probably reduced the number of plants at the site, which, in turn, has probably reduced the natural soil-holding capacity of the vegetation. The estimated loss of soil by water erosion at the West Otero Mesa site under current conditions (which includes cattle grazing on Otero Mesa) is 1.0 ton/acre/year based on the Universal Soil Loss Equation (see Appendix H). Soil loss by wind erosion is estimated at 5 tons/acre/year based on the Wind Erosion Prediction Equation (see Appendix H). The Tularosa Basin site is not grazed. The estimated loss of soil by water erosion at the Tularosa Basin site under current conditions is 0. 6 ton/acre/year based on the Universal Soil Loss Equation (see Appendix H). Soil loss by wind erosion is estimated at 8 tons/acre/year based on the Wind Erosion Prediction Equation (see Appendix H).

Existing Ranges. Soils in the Red Rio and Oscura impact areas consist chiefly of gravelly, sandy, and clay loams; gypsiferous and calcareous soils; and erosional debris surrounding bedrock exposures of limestone, sandstone, shale, gypsum, and basalt (U.S. Air Force, 1994c). The potential for soil erosion ranges from slight to severe, depending on the soil type. If not properly mitigated, surface disturbances that remove vegetation from areas where the wind and water erosion potential is moderate to severe can result in rapid soil loss and severe gully erosion. Soils on Melrose Range are, for the most part, sandy loams (U.S. Air Force, 1995). These soils are underlain in many places by a hard layer of caliche that occurs at various depths below the surface.

3.12.2 Projected Baseline FY00 Conditions

Holloman AFB. Construction of new facilities at Holloman AFB to support the proposed action would be located either adjacent to existing facilities or within areas that are already developed. Except for the proposed 15-acre munitions storage area location, soils in the proposed construction areas are devoid of vegetation because they have been previously already compacted, mixed, and otherwise disturbed.

McGregor Range. The FY00 soil conditions on McGregor Range would be the same as those described in Section 3.12.1.

3.13 SAFETY

Safety issues addressed in this section include fire, ground, flight, and explosive safety considerations. Fire safety focuses on potential fire risks associated with aircraft accidents, and the use of training ordnance and flares in the existing regional airspace and the area proposed for the training range. Ground safety issues concern activities associated with ongoing operations and maintenance, as well as the development and operation of the proposed new facilities associated with the range. Ground safety considerations also include the assessment of potential hazards resulting from the delivery of training ordnance, and the use of lasers on aircraft for ordnance delivery. Aircraft flight safety will consider the risks of aircraft mishaps and bird-aircraft strike hazards. Explosive safety considerations involve the use and handling of ordnance that will be delivered on air-to-ground training ranges, and the use of chaff and flares.

The ROI for safety considerations includes Holloman AFB, the airspace supporting flight and flight-training operations conducted from Holloman, and the land underlying that airspace. The regional airspace supporting training activities conducted from Holloman AFB includes numerous MOAs; several Restricted Areas, some of which include air-to-ground ranges; and 10 MTRs, eight of which are Instrument Routes (IRs) and two of which are Visual Routes (VRs).

The presentation of safety conditions for the affected area is largely conditioned by military aircraft operations. Aircraft operations in the area are expected to change by the year 2000, independently of any proposed action. Therefore, consideration is given to describing current conditions (FY95) and conditions projected to prevail at the time proposed for implementation of the proposed action (FY00).

3.13.1 FY95 Conditions

3.13.1.1 Flight Safety

The primary concern regarding flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of midair collisions, collisions with man-made structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military. Flight safety considerations addressed include aircraft mishaps and bird-aircraft strikes.

Aircraft Mishaps. The U.S. Air Force defines four categories of aircraft mishaps: Classes A, B, C, and High Accident Potential (HAccP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, destruction of an aircraft, or damage to an aircraft beyond economical repair. Class B mishaps result in total costs of more than $200,000, but less than $1 million, or result in permanent partial disability, but do not result in fatalities. Class C mishaps involve costs of more than $10,000, but less than $200,000, or a loss of worker productivity of more than eight hours. HAccP represents minor incidents not meeting any of the criteria for Class A, B, or C. Class C mishaps and HAccP, the most common types of

accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public. This EIS focuses on Class A mishaps.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. It should be noted that combat losses are excluded from these statistics. In the case of MOAs and Restricted Areas, an estimated average sortie duration may be used to estimate annual flight hours in the airspace. For MTRs, the length of the route and the average flight speed of the aircraft using the route may be used to determine the amount of flight time each specific type aircraft will spend on the route each year. Then, the Class A mishap rate per 100,000 flying hours can be used to compute a statistical projection of anticipated time between Class A mishaps in each applicable element of airspace. In evaluating this information, it should be emphasized that those data considered are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

Class A mishap rates are calculated by major aircraft type. Separate rates are not normally calculated for different models of the same aircraft. Therefore, all models of the same aircraft apply the same statistical mishap rate.

All of the airspace addressed for FY95 conditions supports ongoing military training activities. For comparative purposes, airspace supporting similar flight activity is grouped. Therefore, although the Lava, Mesa, Yonder, and McGregor areas are actually Restricted Areas, since the flight activity conducted there is similar to flight activity in MOAs, they are considered as part of that airspace element.

Risk associated with current use of this military training airspace is relatively low. Within the MOA airspace, the highest level of risk occurs in Pecos High MOA, with a statistically predicted 14.8 years between major mishaps. However, when viewed in context, and noting that in Pecos High MOA 2,192 annual sorties are flown by the aircraft involved (F/EF-111), it is seen that this risk equates to one chance in almost 32,500 that a mishap would occur, for a risk probability of 0.00003.

This same relative risk probability (0.00003) occurs on the ranges. The statistically predicted 6.3 years between Class A mishaps on Melrose Range equates to one chance in approximately 32,200.

Not all aircraft always fly the full length of MTRs. Using alternate entry or exit points enables aircrews to shorten the amount of time spent on the route. For example, under current conditions, VR-176 is often completely flown (long route) or the route can be shortened by using an alternate entry point (short route). When this occurs (viz. VR-176), the statistically predicted times between Class A mishaps reflect a weighting of the flying hours used in the calculation to account for these differences. On MTRs, the greatest risk occurs on IR-113, with a statistically predicted time between Class A mishaps of 22.4 years. Based on the indicated annual number of sorties flown on this route, this equates to one chance in approximately 27,000 of a Class A mishap. This risk probability (0.00004) is considered insignificant.

In addition to the direct effects from an aircraft crash (i.e., damage to the aircraft and the point of impact), there may also be secondary effects, such as fire and environmental contamination. The extent of these secondary effects is situationally dependent, and difficult to quantify. For example, there would be a higher risk of fire for aircraft crashes in a highly vegetated areas during a hot, dry summer than would be the case if the mishap occurred in a rocky barren area during the winter.

When an aircraft crashes, it may release hydrocarbons. Petroleum, oils, and lubricants not consumed in a fire could contaminate soil and water. The potential for contamination is dependent on several factors: the porosity of the surface soils would determine how rapidly contaminants are absorbed; the specific geologic structure in the region would determine the extent and direction of the contamination plume; the locations and characteristics of surface and groundwater in the area would also affect the extent of contamination to those resources. As an example, the F-16 aircraft carry a small quantity of hydrazine in a sealed canister that is designed to withstand crash impact damage. Hydrazine is a highly volatile propellant that contains toxic elements. It is carried on the F-16 as part of the emergency engine air-restart system. When used for this purpose, hydrazine is completely consumed, and poses no safety hazard. In any crash that is severe enough to rupture the canister, it is most likely that fire would also be involved. In this case, the hydrazine would also burn and be completely decomposed. In the unlikely event that the hydrazine should be released, but not consumed by fire, impacts on soils and groundwater would likely be of minor consequence. Hydrazine absorbs water at room temperature. It is incombustible in solution with water at concentrations of 40 percent or less, and it evaporates at any given temperature at a rate slightly slower than water. Movement of hydrazine through natural soils has been shown to be slow and limited. Due to its absorption and natural decomposition processes, the probability of released hydrazine significantly contaminating groundwater is considered extremely low. However, if quantities of hydrazine were to reach a surface water body, aquatic life in those areas experiencing high concentrations could be significantly impacted.

Bird-Aircraft Strike Hazards. Bird-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area. Aircraft may encounter birds at altitudes of 30,000 feet MSL or higher; however, most birds fly close to the ground.

Over 95 percent of reported bird strikes occur below 3,000 feet AGL. Approximately 50 percent of bird strikes happen in the airport environment, and 25 percent occur during low-altitude flight training (U.S. Air Force, 1990).

The potential for bird-aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands). Migratory waterfowl (e.g., ducks, geese, and swans) are hazardous to low-flying aircraft due to their size and propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from one to two pounds for ducks, five to eight pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring.

Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,500 to 3,000 feet AGL during the fall migration and from 1,000 to 3,000 feet AGL during the spring migration.

Along with waterfowl, raptors, shorebirds, gulls, herons, and songbirds also pose a hazard. In considering severity, the results of bird-aircraft strikes on MTRs and in Restricted Areas show that strikes involving raptors result in the majority of Class A and B mishaps related to bird-aircraft strikes. Peak migration periods for raptors, especially eagles, are from October to mid-December and from mid-January to the beginning of March. In general, flights above 1,500 feet AGL would be above most migrating and wintering raptors. Songbirds are small birds, usually less than one pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 to 3,000 feet AGL.

While any bird-aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. During the years 1987 to 1989, 9,334 bird strikes were reported worldwide, with four resulting in loss of the aircraft, and one additional occurrence resulting in damage to the aircraft in excess of $1 million. These occurrences constitute approximately one-half of one percent of all reported bird-aircraft strikes (U.S. Air Force, 1990).

Bird-aircraft strikes in the vicinity of Holloman AFB have predominantly involved small songbirds, and have not created a significant problem. The closure of old sewage lagoons which created an attractive habitat for waterfowl will cause them to remain further away from the runway, thus minimizing the potential for bird-aircraft strikes.

The U.S. Air Force Bird-Aircraft Strike Hazard (BASH) Team maintains a database that documents all reported bird-aircraft strikes. Historic information concerning strikes during the last 11 years for the primary training airspace within the ROI is shown in Table 3.13-1. These data reflect total strikes experienced by all users of the airspace, not just aircraft from Holloman AFB.

3.13.1.2 Munitions Use and Handling

Ordnance used includes gun ammunition, training, inert, and live bombs, 2.75 inch rockets, illumination and self-protection flares, and chaff. All ordnance is handled and maintained by specifically trained personnel. Furthermore, Air Force safety procedures require safeguards on weapons systems and ordnance to ensure that arming, launching, firing or releasing does not inadvertently occur. All munitions mounted on aircraft, as well as the guns carried within the aircraft, are equipped with mechanisms that preclude release or firing without activation of an electronic arming circuit.

Training missions to air-to-ground ranges predominantly involve training or inert munitions. Currently, the Red Rio LDT has a capacity to support a small number of live-bomb drops. Nevertheless, training or inert ordnance constitutes the majority of the ordnance dropped on Red Rio, and is the only ordnance authorized on the

Table 3.13-1. Historic Bird-Aircraft Strikes

Airspace	Bird Strikes	Airspace	Bird Strikes
Beak A MOA	0	VR-100/125	2
Beak B MOA	0	VR-176	11
Beak C MOA	0	IR-134/195	5
Talon MOA	N/A[1]	IR-192/194	N/A[2]
Pecos MOA	4	IR-113	28
R-5107	1	IR-102	N/A[2]
R-5103	N/A[1]	IR-141	N/A[2]
R-5104/5105	21	IR-133	5

N/A[1] = No Data Available

N/A[2] = Newly created airspace

Source: USAF BASH Team, 1996.

Oscura impact area and McGregor and Melrose Ranges (see Table 2.1-11 for a detailed listing of ordnance use on specific impact areas and ranges). The most commonly used training munition is the BDU-33, a small training bomb weighing approximately 25 pounds, composed of ferrous metals, and equipped with a small spotting charge that serves as an aid for visual scoring of bombing accuracy. There are two types of spotting charges: those designated as Mark 4 Mod 3 are referred to as "hot spots"; those designated CXU-3A/B are referred to as "cold spots".

The hot spot is similar to a 10-gauge shotgun shell (U.S. Air Force Technical Order T.O.11A4-4-7). A small amount of gunpowder in the cartridge detonates on impact, expelling 10 grams of red phosphorus which produces a brilliant flash of light and dense white smoke. The red phosphorus ignites at 500°F, burns for approximately 0.1 second reaching a maximum temperature of approximately 2,732°F, and produces a six to eight-foot flame from the rear tube of the ordnance (Kilgore, 1990).

The cold spot contains two grams of gunpowder and approximately 17 cubic centimeters (cc) of titanium tetrachloride stored in a glass ampule (U.S. Air Force Technical Order T.O.11A4-4-7). The gunpowder, which detonates on impact, discharges the crushed ampule of titanium tetrachloride from the rear of the unit into the atmosphere. Titanium tetrachloride is an irritant to the skin, eyes, and mucous membranes. However, it is not classified as toxic, and titanium compounds are physiologically inert, being neither flammable or combustible (AKZO Chemicals, 1991). When exposed to the atmosphere, a nonthermal chemical reaction occurs between the titanium tetrachloride and moisture in the air, producing a smoke-like plume. Therefore, the use of cold spots on training ordnance poses minimal fire risk. The plume persists for 15 to 30 seconds, depending on the moisture content of the air and the wind velocity. Since no people are in the impact area during operations, it would be impossible for anyone to come into direct contact with the cloud. Moreover, the small quantities of the substance in the training ordnance (it would require 28 cold spots to provide approximately one pint of titanium tetrachloride) and the byproducts produced are rapidly dispersed and neutralized. Quantities are insufficient to create major human health concerns or major impacts to wildlife.

Gunpowder contains nitroglycerin and nitrocellulose. These materials are ignited and consumed upon impact. Gunpowder combustion products include monoxide, carbon dioxide, and nitrogen oxides.

In those areas designated as impact zones for live ordnance, the explosive trinitrotoluene (TNT) may be present. In high concentrations, TNT is considered to be significantly toxic. However, TNT is almost completely consumed in the explosion of a bomb, which occurs either when the ordnance functions normally or is destroyed by EOD personnel during regular range grooming. Additionally, nitroaromatics such as TNT are highly susceptible to degradation by oxidation, chemical reduction, and biological processes. Only trace amounts of explosive residue would be dispersed into the air and transported by wind currents. Concentrations in the air would be very low and would not be considered a threat to the environment or public health and safety.

Under current conditions, chaff and flares are used in approved airspace. The purpose of chaff is to confuse a radar system that may be tracking an aircraft. It either masks the target aircraft so it cannot be precisely located, or provides multiple false targets on the radar.

Self-protection flares consist of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Their purpose is to provide a heat source other than the aircraft's engine exhaust for an infrared-seeking missile to guide on. When flares are released within restricted airspace over ranges, they are released at established minimum altitudes which ensure that the flare is completely consumed before it reaches the ground. Therefore, no burning material comes in contact with anything on the ground.

Illumination flares are designed to burn for somewhat extended time periods. When released at altitude, their descent is retarded so that they provide a source of illumination for ground activities. Illumination flares are released in such a manner as to ensure that they land within the Red Rio and Oscura impact areas (Hoppes, 1997b).

3.13.1.3 Fire and Ground Safety

Daily operations and maintenance activities on Holloman AFB are performed in accordance with applicable Air Force safety regulations, specific Air Force Technical Orders, and standards prescribed by Air Force Occupational Health and Safety (AFOSH) requirements.

The most important issues associated with fire and ground safety related to activities conducted from Holloman AFB pertain to training conducted in the regional special use airspace, specifically at the air-to-ground weapons ranges. These ranges provide support for the delivery of training, inert, and to a limited extent, live ordnance. Nevertheless, operations are conducted with minimal risk. A comprehensive, documented series of safety procedures govern and direct all activities conducted on the ranges. These processes and procedures address all aspects of range operation, specify maintenance requirements, provide detailed flight information and ordnance delivery procedures to aircrews, and provide direction regarding fire prevention, containment, and response suppression.

Reportable fires are those that ignite and spread beyond established firebreaks. No reportable fires have ever occurred as a result of live ordnance drops. During FY96, five reportable fires occurred on the Red Rio target complex, and burned approximately 1,200 acres. All of these fires occurred between January and May. The greatest fire risk is associated with 50 caliber tracer ammunition. When the probability of fire peaks, range staff curtail the use of this ordnance (Hoppes, 1997b).

Fire safety is a concern at McGregor Range. Vegetation in the area is characterized as a semidesert grassland and shrub community. The fine fuels associated with the grasslands, as well as the natural oils in the mixed scrub areas, provide relatively good carrying potential for a fire.

3.13.2 Projected Baseline FY00 Conditions

Recently, several actions have been proposed that would, if implemented, have an effect on operations conducted in the ROI. Specifically, F/EF-111 operations will cease, F-16 operations will increase, and Tornado aircraft will begin to use the airspace, which may include two new IFR routes (IR-102/141), modifications to Talon MOA, and a new refueling anchor. This projected baseline is discussed in more detail below.

3.13.2.1 Flight Safety

Aircraft Mishaps. The risk of aircraft mishaps that could occur under this projected baseline condition are statistically calculated based on historical occurrences per 100,000 hours of flight. These calculations were discussed in detail in Section 3.13.1.2.

The GAF calculates flight safety statistics differently from the U.S. military services. The GAF calculates an accident rate per 10,000 flight hours, rather than the 100,000 flight-hour basis used by the U.S. military. The GAF also includes all mishaps in their calculations; there is no differentiation with regard to the severity of the mishap. Finally, mishap statistics are based on each year's flight activity; cumulative mishap rates are not used. The process used to develop comparative data as analogous as possible with U.S. data is described below.

Flight safety statistical data for Tornado aircraft were obtained from the GAF for the last five years. These data were normalized to 100,000 flying hours, and an arithmetic average for the five years was calculated; this produced a mishap rate reflecting all mishaps involving the aircraft, including Class A mishaps. In order to reach a reasonable estimate of the proportion of Class A mishaps that were included in this overall rate, safety statistics on the F-15 were examined. Available data included a lifetime history of Class A and B mishaps involving the aircraft. The F-15 was selected as a representative aircraft because it, too, is a twin-engine aircraft that performs a multi-role mission. Data on the F-15 reflected a ratio of approximately 40 percent Class A mishaps and 60 percent Class B mishaps. Applying these ratios to the Tornado statistics produced an estimated Class A mishap rate of 1.12 per 100,000 flying hours. This is the mishap rate used in the flight risk assessment. This estimate is somewhat conservative, since the total number of mishaps contributing to the Tornado mishap rate also include mishaps that are even less severe than Class B mishaps.

There is very low overall risk associated with the use of these airspace elements. In MOAs and Restricted Areas, the minimum statistically predicted time between Class A mishaps is 10.8 years in Pecos Low MOA. For ranges, it is 5.3 years on Melrose Range (R-5104, R-5105). On MTRs, the interval is once every 27.1 years on VR-100/125. If the proposed airspace modifications (U.S. Air Force, 1997a) are not implemented, some change in airspace use over that described here would occur. These changes are considered negligible in the context of flight safety. To place the interval indicating the greatest risk into context (5.3 years on Melrose Range), at the given level of flight activity this means that there is only one chance in more than 43,500 (a probability of 0.00002) of an aircraft mishap. Since all other intervals are

significantly greater than this, the risk associated with those operations is proportionately less.

Bird-Aircraft Strike Hazard. Refer to Section 3.13.1.2 for information on bird-aircraft strike hazards, and Table 3.13-1 for the historic incidence of bird-aircraft strikes in the Holloman airspace.

3.13.2.2 Munitions Use and Handling

Ordnance used includes gun ammunition, training, inert, and live bombs, 2.75 inch rockets, self-protection and illumination flares, and chaff. Tornado aircraft are equipped with 27mm cannon, and the GAF version of the MK-106 practice munitions is designated as DM-18. Other ordnance employed is similar to that used by U.S. aircraft. Additional details on Tornado armament are contained in Appendix B. Chaff is released by Tornado aircraft in bursts.

3.13.2.3 Fire and Ground Safety

Aircraft operations and aircraft overflight, in and of themselves, do not create any specific or significant fire or ground safety risks. This projected baseline does not change the current description of fire and ground safety issues presented in Section 3.13.1.1.

CHAPTER 4.0

ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

Comments from the public and Federal and state agencies during scoping and the public comment period for this EIS focused on a series of environmental resources. This chapter builds upon those comments and describes the potential environmental consequences to the resources from beddown and training of 30 additional Tornado aircraft and aircrews at Holloman AFB. Environmental consequences for each resource are evaluated for the three training options described in Chapter 2.0[1] and for the No-Action alternative. All impacts are evaluated against baseline conditions projected for FY00 when the proposed action would be implemented. Chapter 5 addresses, for each resource, the cumulative impacts of the proposed action in concert with other actions that have been recently implemented, or will be implemented in the reasonably foreseeable future.

The FAA is currently reviewing a proposal to reconfigure three existing airspace units in southeast New Mexico and west Texas: IR-102 and IR-141 (IR-102/141), and Talon MOA. These modifications are collectively referred to as the ALCM/Talon action. The environmental consequences of implementing ALCM/Talon are addressed in *Environmental Assessment of Proposed Airspace Modifications to Support Units at Holloman Air Force Base, New Mexico* (U.S. Air Force, 1997a). These changes in airspace configuration under ALCM/Talon are taken into account in the design of the GAF beddown proposed action and the subsequent environmental analysis. If the ALCM/Talon action is not implemented, slight modifications of MTR and MOA use, as discussed in Chapter 2.0, would be required to support the proposed action. The following analysis takes these differences into account.

4.1 AIRSPACE USE AND MANAGEMENT

Section 3.1 described how airspace in this region is established and managed in order to accommodate its compatible use by military and civil aviation. The following provides an analysis of how the proposed action would affect airspace use and management. The analysis makes use of projected changes in airspace use expressed in terms of average daily (day and night combined) sorties. For the purpose of analysis, 250 flying days per year are assumed. This average provides a good representation of how many military flights are expected to occur on a typical daily basis.

Overall, implementation of the proposed action was found to result in little change in the daily average sortie levels for any of the affected airspace above the levels that would prevail in FY00. This conclusion remains the same for both NTC training

[1] See Figures 2.1-14 through 2.1-18 for depiction of MOAs, MTRs, and Restricted Areas. Tables 2.1-5 through 2.1-14 portray baseline and proposed airspace use.

options, and the Existing Range training option. It is concluded that implementation of the proposed action would not affect the use or management of this regional airspace. This conclusion remains the same whether or not the ALCM/Talon action is implemented. Implementation of the No-Action alternative would result in no change in airspace management and use.

4.1.1 Proposed Action

4.1.1.1 Impacts Common to All Training Options

Holloman AFB. Under any of the training options, the average number of sorties operating out of Holloman AFB on a normal flying day would increase from 59 to 76. Multiple pattern operations (TGOs and low approaches) normally conducted for pilot proficiency following a mission would increase from 112 to 157 per day. These increases in sorties and airfield operations would not impact Holloman airspace. Arrival/departure routes, traffic patterns, or flight operating procedures governing base flight operations are not expected to change as a result of these increased sortie levels. Average daily operational levels at the base in the mid-1980s were over 200 sorties and 600 multiple patterns. Increased Holloman AFB operations would have little effect on civil aircraft operating at the Alamogordo-White Sands Regional and Carrizozo Municipal Airports or the three private airfields northeast of the base. The level of ATC radar and traffic advisory services currently available would be unaffected by training.

Oscura and Red Rio Target Complexes. All training options under the proposed action include installation of TOSS components at the Oscura and Red Rio target complexes. Establishment and use of these components would not affect airspace management in these areas.

4.1.1.2 Impacts Common to NTC Training Options

Military Training Routes. Use of each MTR supporting Holloman training missions is less than seven sorties per day under FY00 conditions. Daily training for the 30 Holloman-based Tornados would increase less than one sortie per day for most affected MTRs. Daily training on VR-176 Short, IR-134/195, and IR-192/194 would increase two to three sorties per day. Such daily average increases would have negligible effect on the current use of MTR airspace. Pilots are informed of the avoidance locations and other special operational considerations prior to training on these routes. Both military and VFR civil aircraft pilots watch for and avoid each other.

Military Operations Areas. Average use of the Beak and Pecos MOAs would increase by less than one daily sortie compared to FY00 levels. The use of Talon MOA would increase from approximately seven to 10 daily sorties. This increase is insignificant when considering the overall time each aircraft spends in the large expanse of the MOA airspace. Increased use by Tornado aircraft would not adversely

affect current use of MOA airspace by civil VFR or IFR aircraft. IFR aircraft transiting MOA airspace are provided separation from military flights, and both military and VFR civil aircraft pilots are responsible for avoiding each other within a MOA.

Restricted Areas. Airspace within WSMR and McGregor Range is subdivided into individual areas so that different training missions can be conducted simultaneously within each of these areas. Those areas used for air combat maneuver training include Lava East/West, Mesa High/Low, and Yonder within the WSMR restricted airspace, and McGregor High, which overlies McGregor Range. Average daily sorties for Lava East/West and Mesa High would increase from approximately 26 sorties per day to 28 sorties per day. Mesa Low would increase from approximately six to nine sorties per day; Yonder would remain at less than two sorties per day. The proposed increased use of restricted airspace would not be significant and would not affect any general aviation activities.

The proposed training options include use of the following: Oscura and Red Rio impact areas, Melrose Range, and McGregor Range. The change in the average number of daily sorties proposed for these ranges and their associated Restricted Areas would be within two sorties per day of FY00 levels, except for the proposed NTC areas. Under either NTC training option, an increase of about 14 daily sorties for McGregor Range would be conducted within the NTC area. The use of restricted airspace is required for the conduct of hazardous activities, such as munitions delivery training. The proposed NTC would be located within the McGregor Range Restricted Area (R-5103). The additional use associated with the NTC has the potential to require the rerouting of a small number of civilian aircraft.

Aerial Refueling Anchors. Under the proposed action, two types of aerial refueling would occur: refueling by tanker aircraft at higher altitudes, and Tornado-to-Tornado ("buddy-buddy") refueling at about 1,000 feet AGL. Up to one-fourth of the projected 517 annual Tornado refueling operations would be conducted in the two higher-altitude refueling anchors (AR-602 and AR-644), where the lowest altitude of use is 19,000 feet MSL. These ARs are above the altitude where VFR flight is permitted (18,000 feet MSL); therefore, ATC would provide separation between the refueling operations and any other civil or military IFR aircraft transiting through those areas. The other three-fourths of the aerial refueling by tanker aircraft operations are projected to occur in the 12,000 to 18,000 foot MSL AR-X652 in west Texas.

Tornado "buddy-buddy" refueling operations would occur randomly along various MTRs at about 1,000 feet AGL. Because VFR aircraft may operate at those lower altitudes, they would be responsible for seeing and avoiding the refueling aircraft. Any IFR aircraft operating within the AR-X652 altitude range would be separated from refueling activities by ATC.

Establishment of AR-X652 is part of proposed airspace modifications pending FAA approval (U.S. Air Force, 1997a). In the event that these modifications are not implemented, refueling activities that are proposed for AR-X652 would be redirected toward AR-602 and AR-644. While this would increase the use of these anchors, ATC would continue to provide separation between the refueling operations and any other civil or military IFR aircraft transiting those areas.

4.1.1.3 Impacts Specific to the West Otero Mesa Training Option

Potential issues and impacts associated with development of an NTC at the West Otero Mesa site are identical to those described for the development of an NTC in general. Development of an NTC at this site would result in no significant adverse impact to airspace management.

4.1.1.4 Impacts Specific to the Tularosa Basin Training Option

As with the West Otero Mesa site, the development of an NTC at the Tularosa Basin site would result in no significant adverse impact to airspace management. However, the Tularosa Basin site does differ from the West Otero Mesa site in one respect with regard to airspace management: the land encompassed by and the airspace associated with the site are more heavily used by Fort Bliss for weapons firing than are the land encompassed by and airspace associated with the West Otero Mesa site. As a result, the potential for canceled missions would be higher for an NTC at the Tularosa Basin site than for the West Otero Mesa site. This increased potential for canceled missions would not, however, result in a significant impact to airspace management.

4.1.1.5 Impacts Specific to the Existing Range Training Option

Projected impacts to airspace use would be similar to those projected for the NTC training options. Use of VR-100/125, VR-176 Short, IR-133, and IR-113 would increase two to five sorties per day. Such changes in MTR use would not adversely affect the airspace encompassing these routes and no significant impact would be expected. Daily use of the Oscura impact area and Melrose Range would increase by six sorties per day without the NTC. This increased use would not affect other air traffic due to the existing limited access imposed by the Restricted Area. Implementation of this training option would not be expected to result in significant or adverse impacts to airspace.

4.1.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as

described in Chapter 2.0. These changes would have a minimal effect on airspace use and management, and the above-stated conclusions would remain unchanged.

4.1.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in projected airspace use for any of the airspace considered under the proposed action. As a result, this alternative would have no adverse effect on airspace management and use.

4.2 NOISE

Implementation of the proposed action would result in changes in aircraft activity at the Holloman AFB aerodrome, and in areas underlying affected airspace. These changes in activity would result in changes in sound levels. In the area near Holloman AFB, the area exposed to sound levels above 65 dB (L_{dn}) would increase by about 12 percent over FY00 levels, a change not considered significant. In areas underlying affected airspace, in most cases sound levels for the preferred option would change by less than 3 dB (L_{dnmr}). In no case would the sound level increase by more than 7 dB. Changes in noise level of less than 3 dB, using the L_{dnmr} metric, are generally imperceptible to the human ear. Changes in noise levels between 3 and 4 dB are potentially noticeable and changes between 5 and 7 dB would be noticeable to the human ear. Any change greater than 7 dB would be noticeable as a substantial change in the noise environment. Overall, the resulting sound levels would increase, but in most cases the change would not be perceptible to the human ear.

An assessment of aircraft noise requires a general understanding of how sound is measured and how it affects people and the natural environment. Appendix D provides a detailed discussion of noise and its effects on people and the environment. The following summarizes significant information needed to understand the noise analysis.

Noise Metrics. The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning or interpretation and each was developed by researchers in an attempt to represent the effects of environmental noise. The noise metrics used in this EIS are the maximum sound level (L_{max}), the Sound Exposure Level (SEL) , and the Onset Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Each of these metrics represents a "tier" for quantifying the noise environment as discussed below.

L_{max}, SEL, and L_{dnmr} employ A-weighted sound levels. "A-weighted" denotes the adjustment of the frequency content of a noise event to represent the way in which the average human ear responds to the noise. All noise metrics are A-weighted unless stated otherwise.

Maximum Sound Level. L_{max} represents the first tier in quantifying the noise environment. It is the highest sound level measured during a single aircraft overflight. For an observer, the noise level will start at the ambient noise level, rise up to the maximum level as the aircraft flies closest to the observer and return to the ambient level as the aircraft recedes into the distance. Maximum sound level is important in judging the interference caused by an aircraft noise event with conversation, sleep, or other common activities. Table 4.2-1 lists representative maximum sound levels for the five dominant aircraft types directly under the flightpaths at aircraft altitudes of 100, 300, 500, 1,000, 2,000, 5,000, 10,000, and 20,000 feet.

Sound Exposure Level. The second tier is the SEL, which combines the maximum level of the event and its duration. The maximum sound level alone may not represent how intrusive an aircraft noise event is, because it does not consider the length of time that the noise persists. The time duration over which the noise event is heard is also important. The SEL combines both of these characteristics into a single metric. It is important to note, however, that SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the total exposure of the entire event.

The SELs for the five model aircraft are tabulated in Table 4.2-2. As evidenced by Tables 4.2-1 and Table 4.2-2, the maximum instantaneous level during a noise event is typically zero to 15 dB lower than the SEL above an altitude of 500 feet AGL. Aircraft sounds with SELs of 65 dB will typically have a maximum sound level in the 50 to 65 dB range. Table 4.2-3 provides data on L_{max} and SEL at various distances for various aircraft at 100, 300, 500, 2,000, and lateral 5,000 feet.

Cumulative Noise Metrics. The first and second tier (L_{max} and SEL) provide a description of a single aircraft overflight. But neither of these metrics describe in a single measure the overall noise impact from multiple aircraft noise events. The third tier is the L_{dnmr}, which sums individual noise events and averages the resulting level over a specified length of time. Thus, it is a composite metric that incorporates the maximum noise levels, the duration of the events, and the number of events. This cumulative metric does not represent the variations in the sound level heard. It does provide an excellent measure for comparing environmental noise exposures when there are multiple aircraft noise events to be considered.

Cumulative noise metrics such as L_{dnmr} are most useful for comparing the noise produced by alternate sets of operations. It is often important, for example, to quantify how much more or how much less noise a proposed action creates with respect to a "no-action" condition.

L_{dnmr} is an enhanced version of the widely accepted Day-Night Average Sound Level (L_{dn}, also denoted DNL). L_{dn} is a cumulative metric that accounts for the sound level

Table 4.2-1. Representative Maximum (L_{max}) A-Weighted Sound Levels[1] at Various Altitudes[2]

Aircraft Type	Altitude (Ft AGL)							
	100	300	500	1,000	2,000	5,000	10,000	20,000
F-4	130	119	115	107	99	87	75	60
F-16	119	109	104	97	89	76	64	48
F-117	127	116	111	103	94	79	65	46
T-38	103	93	88	81	73	61	49	36
Tornado	124	113	108	101	93	79	66	50
Other[3]	129	119	114	107	98	86	73	57

[1]The values shown represent average sound levels. These levels may vary by ± 2 dB depending on the application of power and speed.

[2]It should be noted that in accordance with U.S. Air Force regulations [AFI 11-206 (U.S. Air Force, 1994b) and Federal Aviation Regulation Part 91.119 (FAA, 1992)], aircraft must avoid congested areas and settlements by 1,000 feet, within a horizontal radius of 2,000 feet of the aircraft, and isolated persons, vessels, vehicles, or structures by 500 feet. The GAF regulations are more restrictive than the U.S. Air Force regulations.

[3]Representative data for other aircraft types using affected airspace (see Chapter 2.0).

Table 4.2-2. Representative A-Weighted Sound Exposure Levels[1] at Various Altitudes[2]

Aircraft Type	Altitude (Ft AGL)							
	100	300	500	1,000	2,000	5,000	10,000	20,000
F-4	125	118	114	109	103	92	83	70
F-16	114	107	103	98	91	81	70	56
F-117	123	115	111	105	97	85	73	56
T-38	102	95	91	86	80	70	60	49
Tornado	119	112	108	102	96	85	74	59
Other[3]	124	116	112	107	101	90	80	65

[1]The values shown represent average sound levels. These levels may vary by ± 2 dB depending on the application of power and speed.

[2]It should be noted that in accordance with U.S. Air Force regulations [AFI 11-206 (U.S. Air Force, 1994b) and Federal Aviation Regulation Part 91.119 (FAA, 1992)], aircraft must avoid congested areas and settlements by 1,000 feet, within a horizontal radius of 2,000 feet of the aircraft, and isolated persons, vessels, vehicles, or structures by 500 feet. The GAF regulations are more restrictive than the U.S. Air Force regulations.

[3]Representative data for other aircraft types using affected airspace (see Chapter 2.0).

Table 4.2-3. Representative A-Weighted Sound Exposure Levels at Various Lateral Distances and Altitudes

Aircraft	Lateral Distance (Feet)	Sound Levels at Selected Altitudes (Feet AGL)* 100 SEL	100 Lmax	300 SEL	300 Lmax	500 SEL	500 Lmax	2000 SEL	2000 Lmax	5000 SEL	5000 Lmax
F-117	0	123.3	127.4	115.3	116.5	111	110.9	97.5	93.8	85.4	79.3
	1,000	101.2	99.3	103.2	101.2	103	100.8	96.2	92.2	85.1	79
	2,000	90.5	86.8	95.1	91.4	95.8	92.1	93	88.4	84.2	77.9
	5,000	75.4	69.3	79.6	73.5	82	75.8	83.5	77.2	79.3	72.3
	10,000	62.8	54.9	62.8	54.9	65.9	58	70.8	62.9	69.8	61.6
	15,000	53.5	44.4	53.5	44.4	53.5	44.4	60.8	51.7	61.3	52.1
	20,000	45.9	36.2	45.9	36.2	45.9	36.2	52.4	42.7	53.8	44
	25,000	39.8	29.4	39.8	29.4	39.8	29.4	45.4	35	47.7	37.2
F-4	0	125.4	129.9	118.1	119.7	114.3	114.6	102.7	99.4	92.5	86.8
	1,000	105.5	103.9	107.5	105.9	107.3	105.6	101.6	98	92.3	86.5
	2,000	95.7	92.4	100.3	97.0	101.1	97.7	98.9	94.6	91.6	85.7
	5,000	82.5	76.8	86.7	81.0	89.1	83.4	90.8	84.9	87.6	81
	10,000	72.5	65.0	72.5	65.0	75.6	68.1	80.6	73.1	80.1	72.3
	15,000	65.3	56.7	65.3	56.7	65.3	56.7	72.6	64.1	73.4	64.7
	20,000	59.6	50.3	59.6	50.3	59.6	50.3	66.1	56.8	67.7	58.3
	25,000	54.7	44.8	54.7	44.8	54.7	44.8	60.4	50.4	62.7	52.7
T-38	0	102.2	103.5	94.9	93.3	91.2	88.3	79.6	73.1	69.6	60.7
	1,000	82.4	77.6	84.4	79.6	84.2	79.3	78.5	71.7	69.4	60.4
	2,000	72.6	66.1	77.2	70.7	78	71.4	75.8	68.4	68.7	59.6
	5,000	59.6	50.7	63.8	54.9	66.2	57.3	67.9	58.8	64.8	55
	10,000	50.1	39.3	50.1	39.3	53.2	42.4	58.3	47.4	57.9	46.8
	15,000	43.6	31.9	43.6	31.9	43.6	31.9	51	39.3	51.9	40
	20,000	38.6	26.1	38.6	26.1	38.6	26.1	45.2	32.6	46.8	34.2
	25,000	34.5	21.4	34.5	21.4	34.5	21.4	40.2	27.1	42.6	29.5
F-16	0	113.9	119.5	106.7	109.4	103	104.4	91.5	89.3	81.1	76.5
	1,000	94.3	93.8	96.3	95.8	96.2	95.5	90.4	87.9	80.9	76.2
	2,000	84.5	82.3	89.1	86.9	89.9	87.6	87.6	84.5	80.1	75.3
	5,000	71.1	66.5	75.3	70.7	77.7	73.1	79.3	74.6	75.8	70.3
	10,000	60.2	53.8	60.2	53.8	63.3	56.9	68.3	61.8	67.6	60.9
	15,000	52.2	44.7	52.2	44.7	52.2	44.7	59.5	52.1	60.2	52.6
	20,000	45.8	37.6	45.8	37.6	45.8	37.6	52.3	44.1	53.8	45.6
	25,000	40.5	31.7	40.5	31.7	40.4	31.7	46.1	37.3	48.4	39.6
Tornado	0	119.2	123.7	111.8	113.4	108.1	108.3	96	92.7	85	79.3
	1,000	99.1	97.5	101.1	99.5	100.9	99.2	94.8	91.2	84.7	79
	2,000	89.0	85.7	93.6	90.3	94.4	91	92	87.8	83.9	78.1
	5,000	75.0	69.3	79.2	73.5	81.6	75.8	83.2	77.3	79.4	72.8
	10,000	63.5	56.0	63.5	56.0	66.6	59.1	71.6	64	70.8	63
	15,000	55.1	46.6	55.1	46.6	55.1	46.6	62.5	53.9	63.1	54.4
	20,000	48.8	39.5	48.8	39.5	48.8	39.5	55.3	46	56.9	47.5
	25,000	43.6	33.8	43.6	33.8	43.6	33.8	49.3	39.4	51.6	41.7

*It should be noted that in accordance with U.S. Air Force regulations [AFI 11-206 (U.S. Air Force, 1994b) and Federal Aviation Regulation Part 91.119 (FAA, 1992)], aircraft must avoid congested areas and settlements by 1,000 feet, within a horizontal radius of 2,000 feet of the aircraft, and isolated persons, vessels, vehicles, or structures by 500 feet. The GAF regulations are more restrictive than U.S. Air Force regulations.

and duration of individual events, and the number of events. It includes a 10 dB penalty for events occurring at night. L_{dnmr} includes two additional factors. First, it includes an onset-rate penalty to account for increased annoyance associated with the surprise factor ("startle effect") of high-speed, low-altitude military aircraft noise. This penalty can be up to 11 dB for low-altitude, high-speed fighter aircraft that can produce a sound that rises to its maximum noise level in less than one second. Second, it is based on operations during the busiest month of the year, so that predictions are not diluted by seasonal periods of low activity.

L_{dn} (and, by extension, L_{dnmr}) is based on decades of research on the effects of noise on communities. Dozens of metrics have been proposed, with each accounting for the magnitude, duration, and frequency of noise events. L_{dn} has emerged as the most widely accepted metric. It correlates well with community response, and is consistent with controlled laboratory studies of people's perception of noise. It was the primary metric used in EPA's "levels document" (USEPA, 1972), and was further endorsed for aviation noise analysis by the Federal Interagency Committee on Noise (FICON, 1992). While originally developed for major noise sources such as highways and airports in populated areas, L_{dn} has been shown to be applicable to infrequent events (Fields and Powell, 1985) and to rural populations exposed to sporadic military aircraft noise (Stusnick et al., 1992; 1993). L_{dn} works for both rural and urban settings because L_{dn} accounts for the sound level and duration of the individual aircraft events, as well as the number of events over a stated time period.

L_{dn} can be interpreted in two ways: (1) as an average, its formal definition, which fits intuitive concepts when dealing with continuous noise such as that from a busy highway; (2) as a summation (an average represents a summation divided by a time period). Because L_{dn} corresponds to a fixed 24-hour period, it represents the total sound energy over that period. For that reason, L_{dn} is often referred to as a "cumulative" metric. For intermittent sounds, it does not represent the sound level at any given time, but represents the total sound being received (i.e., the "noise dose" for a day).

Interpretation of the Noise Results. Interpretation of L_{dn} or L_{dnmr} is usually based on the "Schultz curve" (shown in Figure D-2 of Appendix D). This curve predicts the average response of communities to various L_{dn} levels. It was first published in 1978 (Schultz, 1978) and has been updated and validated several times (e.g., Fidell et al., 1991). Features represented by this model include a single inflection point — annoyance never going to zero as noise level decreases (some people are always annoyed), and annoyance never going to 100 percent as noise level increases (some people are never annoyed, or never complain). Nevertheless, public comments indicate that some people are currently annoyed by existing noise levels and those individuals, and perhaps others, may continue to be annoyed by any increase in decibel levels.

The most common point referred to on the Schultz curve is 65 dB. This is a benchmark often applied to determine residential land-use compatibility around

airports or highways. By extension, it is often used as a criterion in planning of airspace. For this EIS, it is recognized that affected areas are diverse and it is not appropriate to use a single criterion.

The 65 dB L_{dn} value is useful to recognize as a level that, when exceeded, is normally not compatible with residential land use. The significance of other levels are as follows:

- An L_{dn} of 55 dB was identified by EPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety" (USEPA, 1972). Noise may be heard, but there is no risk to the public or its welfare.

- At L_{dn} values below 55 dB, the percentage of annoyance is correspondingly lower. Annoyance is never zero, but at an L_{dn} of 45 dB or less it is low enough to be negligible.

Sound levels greater than 70 to 75 dB represent levels at which significant impacts might be plausible. A 24-hour energy equivalent Sound Level (L_{eq}) greater than 82 dB represents levels at which hearing damage is a known risk (OSHA, 1983). L_{eq} is identical to L_{dn}, with the exception that L_{eq} does not have a 10 dB adjustment for nighttime noise events. According to OSHA, higher sound levels without the use of hearing protection are permissible for shorter durations. For example, the highest level OSHA reports is 115 dB for a duration of 15 minutes or less over a 24-hour period, 110 dB for 30 minutes, and 100 dB for 120 minutes. Other than for the impact areas of the various ranges, and within the Holloman aerodrome, the highest average sound level that would result from implementation of any of the training options considered is estimated to be 64 dB.

Human Health Effects. Based on the results of an extensive review of existing research (Air National Guard, 1997) on the effects of low-altitude aircraft noise on humans, health effects from military training operations in any of the airspace associated with the proposed action would be unlikely. Researchers have concluded that the risk of hearing damage from the noise levels that would be associated with the use of the MOAs and MTRs can generally be ruled out, even in small children. Other health risks, such as adverse cardiovascular effects or mental health problems, have not been demonstrated to be associated with the noise levels and exposure rates associated with the proposed action. In general, no scientific basis was found to support claims that potential health effects exist for time-averaged aircraft sound levels below 75 dB.

Methodology for Predicting Noise. Analysis of the aircraft noise levels under the affected airspace was computed using the U.S. Air Force's MRNMAP noise model (Lucas and Calamia, 1996), which is based on the Air Force's NOISEMAP program (Moulton, 1992). Within MOAs with no preferred patterns, the model computes noise based on a uniform distribution of sorties weighted by the percent of time the sorties are within the airspace. For MTRs and similar patterns within MOAs,

MRNMAP incorporates the calculations used by the U.S. Air Force's ROUTEMAP program (Lucas and Plotkin, 1988). NOISEMAP routines are also included within MRNMAP for special conditions not represented by the MOA or route algorithms, such as bombing patterns. MRNMAP calculates noise levels at points on a regular grid within the ROI. Results are output via the NOISEMAP noise-contouring routine NMPLOT, either as contours of various noise levels or as levels at individual grid points.

MRNMAP calculates the noise levels based on the operations data provided by the airspace manager and the aircrews that currently train in the ROI. The airspace manager maintains records on the number of monthly operations flown, the airspace units used, and the amount of time each aircraft is scheduled to spend in a given airspace unit. This information is used to determine the amount of use each airspace unit experienced during 1995. While the amount of time each aircraft spends in one specific airspace unit is variable, because the purpose is to maximize training, the maximum time scheduled is an excellent average for the time used for modeling purposes. Projected operations are based on the training readiness matrix for aircrews to maintain proficiency.

The aircrews provided input on the average time an aircraft spends at different altitudes, average airspeeds, and average power settings required for that airspeed. Averages may be thought of in terms of driving your car to the store where the average driving speed might be 45 miles per hour; however, over that distance stop signs, traffic lights, and stretches of open road would be encountered, drastically affecting speed at any given moment. Therefore, "averages" are used to represent reality. The altitude profile is an average of above ground level readings experienced from the time the aircraft enters the airspace unit until the time it departs that unit and is dependent on the type of aircraft and its mission. Thousands of hours of radar data have also been collected and analyzed at several range complexes (Nellis AFB, China Lake Naval Air Warfare Center, WSMR) to study the amount of time an aircraft spends at different altitudes. This information, combined with pilot interviews, was used in estimating the average altitude profile. Again, the altitude profiles entered into the model represent annual average profiles and do not represent the profile that may be flown during a single training sortie. The average airspeeds and power settings were based on airspeeds that were assumed for mission planning, and were further constrained by fuel requirements and time limitations.

Averages are also used to determine the spatial distribution of aircraft within an airspace unit by separating the total number of operations flown into missions that can be individually modeled. All of the operations in the ROI are described as either randomly distributed over the airspace or confined to specific patterns. The random operations were modeled to represent conditions when aircraft can literally fly anywhere in the entire airspace unit assigned for that particular mission. Superimposed on these randomly distributed operations are more restricted flight patterns such as MTRs and bombing run patterns. Because all of this activity

contributes to the noise environment, each element was modeled separately and summed together to develop a composite noise model.

The reliability of the noise modeling results is dependent on (1) the operations data entered into the model, (2) the measured aircraft noise data used in the calculations, and (3) the propagation algorithms contained in MRNMAP. The operations data entered into the model are carefully reviewed by airspace personnel who are expert at the training conducted in the ROI. These data represent the operations during the busiest month of the year so that the noise predictions are not diluted by periods of low activity; if anything, they overpredict the noise level slightly. The power and speed settings, altitude profile, and spatial distribution are dependent on the training syllabus.

The measured aircraft noise data used in the calculations comes from the DOD, which collects and maintains aircraft noise data for the purpose of noise modeling. The acoustical data set used by the noise model is regularly updated with the latest noise measurements. Acoustical measurements are made by using dedicated aircraft that fly under control conditions over a microphone array. The recordings are incorporated into a noise file data set that is used by MRNMAP.

The propagation algorithms used in the noise model account for spherical spreading, atmospheric absorption, and lateral attenuation. Not included in the noise model are the effects due to wind and ground topography. Spherical spreading is the loss in acoustical power due to the spreading of sound energy. The sound energy reaching the receiver decreases at a rate proportional to $1/r^2$ or at the well-known rate of 6 dB per doubling of the separation distance between the aircraft and the receiver. Atmospheric absorption is the acoustic energy that is absorbed by the atmosphere. Day-to-day variations or even hourly variation in the atmosphere can increase or decrease the amount of acoustic energy that is absorbed. For noise modeling purposes, annual average temperature and relative humidity are used in the noise model to account for the amount of air absorption. Lateral attenuation is the loss in acoustic energy that is due to reflection of sound by the ground. Lateral attenuation is based primarily on the height of the aircraft and the horizontal distance measured between the aircraft and the receiver. At low aircraft altitudes and sideline distances greater than several thousand feet, lateral attenuation is a dominant factor in sound absorption.

Because of the problems associated with the calculations of noise in mountainous areas, studies have been conducted on the effect of terrain (Plotkin et al., 1993; NATO, 1994). These studies tentatively show that topographic features can sometimes cause momentary increases in noise levels ("reflections", potentially up to 3 dB for brief periods) and can sometimes decrease noise substantially ("shielding", often in excess of 20 dB). The net result is lower cumulative noise levels than predicted from flat ground. Low-altitude flight altitudes are also expressed as AGL. In mountainous areas, the rapidly changing terrain prevents aircraft from flying at a precise AGL altitude. Therefore, altitudes above low areas

on average are correspondingly higher. By using the specified altitude AGL in the analysis, the calculations assume aircraft are at lower altitudes than they would actually fly. The net result is a conservative calculation that tends to overpredict the cumulative noise levels.

The limitation of all noise models is that the reliability of the results varies depending on the noise levels calculated. The lower the noise level (below 55 dB), the greater the uncertainties. There are two reasons for these uncertainties. First, when flight activity is high, time-averaged sound levels below 55 dB will occur at relatively long distances from aircraft, giving atmospheric propagation effects greater opportunity to cause significant variability, which increases the uncertainty in the sound level of individual flights. Second, when flight activity is low, the time-averaged sound levels are generated by only a few individual aircraft noise events, which may not be statistically representative of the given aircraft modeled. Conversely, when flight activity is close to the ground and propagation distances are short, the uncertainties associated with atmospheric effects and lateral attenuation are minimal.

Studies have been conducted (Lucas, 1995; Page et al., 1996) to validate the reliability of aircraft noise model predictions. These studies have shown that the overall difference (L_{dn}) between measured and predicted noise levels is bounded by ±2 dB. This 2 dB range has been validated down to L_{dn} 55 dB for a range of independent test conditions (speed, power setting, and the distance from the aircraft to receiver).

4.2.1 Proposed Action

Implementation of the proposed action would affect noise conditions in the vicinity of the Holloman aerodrome and in areas underlying affected airspace. These changes are evaluated in the following subsections. The analysis compares the effects of implementation of the proposed action against conditions that would be expected to prevail at the time the action would be implemented in FY00.

4.2.1.1 Impacts Common to All Training Options

Holloman AFB. Figure 4.2-1 shows the noise contours for Holloman AFB that would prevail following implementation of the proposed action in FY00. Table 4.2-4 shows the area circumscribed within various noise contour levels under the proposed action, and under baseline conditions. Under the proposed action, the area within the L_{dn} 65 dB contour would increase by about five square miles (12 percent) over projected FY00 baseline conditions. This change would be broadly distributed throughout the affected area. Figure 4.2-2 compares the noise contours under the proposed action and FY00 baseline conditions, respectively.

Oscura and Red Rio Target Complexes. All training options under the proposed action include installation of TOSS components at the Oscura and Red Rio target

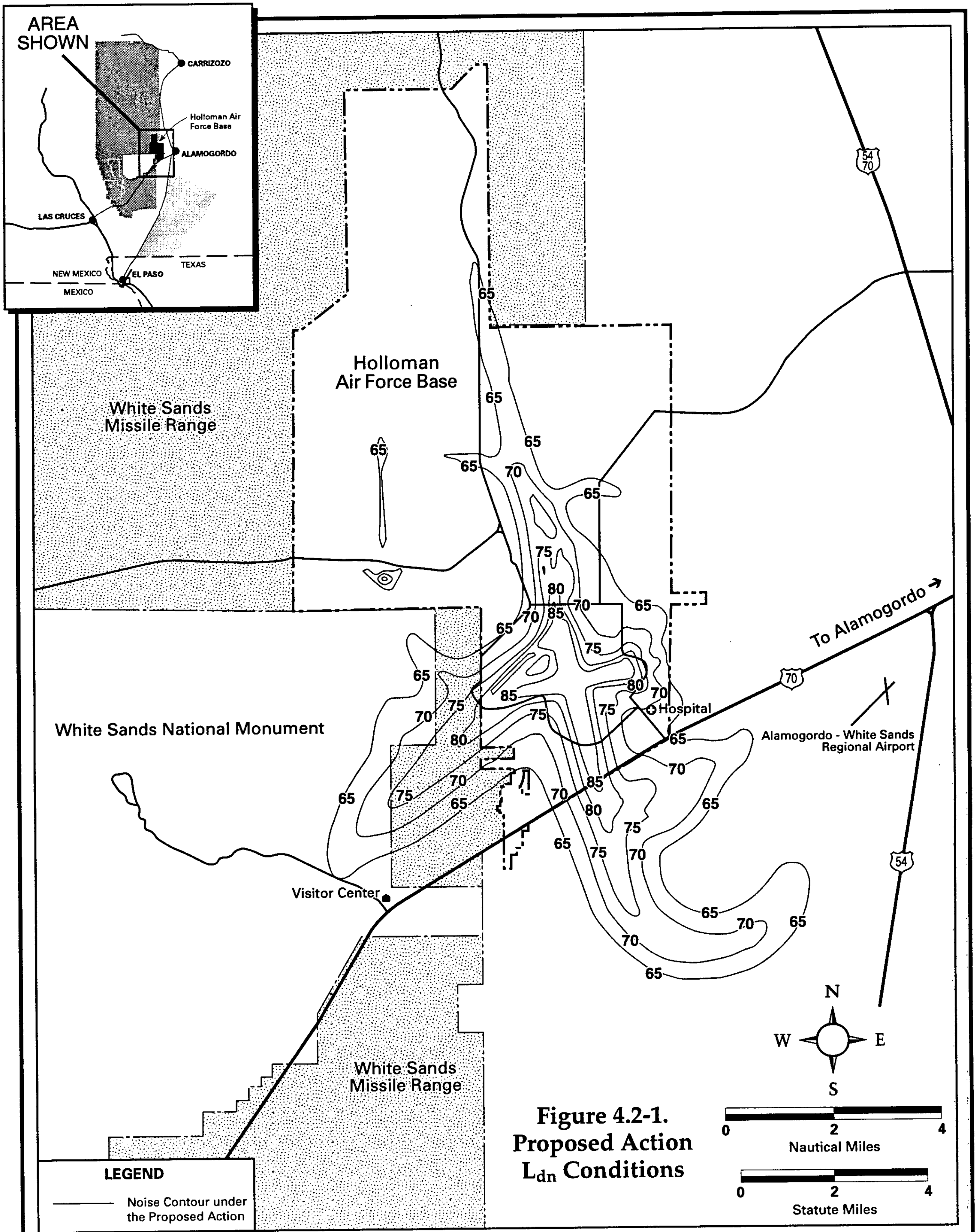

Figure 4.2-1. Proposed Action L_{dn} Conditions

Table 4.2-4. Area within Noise Contours under the Proposed Action Compared to FY00 Baseline Conditions

Contour Level (L_{dn})	Area Contained within Various Contour Intervals			
	Square Miles			Percent Change
	FY00 Baseline	Proposed Action	Change	
65	41.5	46.5	5.0	12.1%
70	21.8	25.0	3.2	14.7%
75	10.5	12.3	1.8	16.8%
80	4.7	5.5	0.8	16.7%
85	2.1	2.5	0.4	18.3%

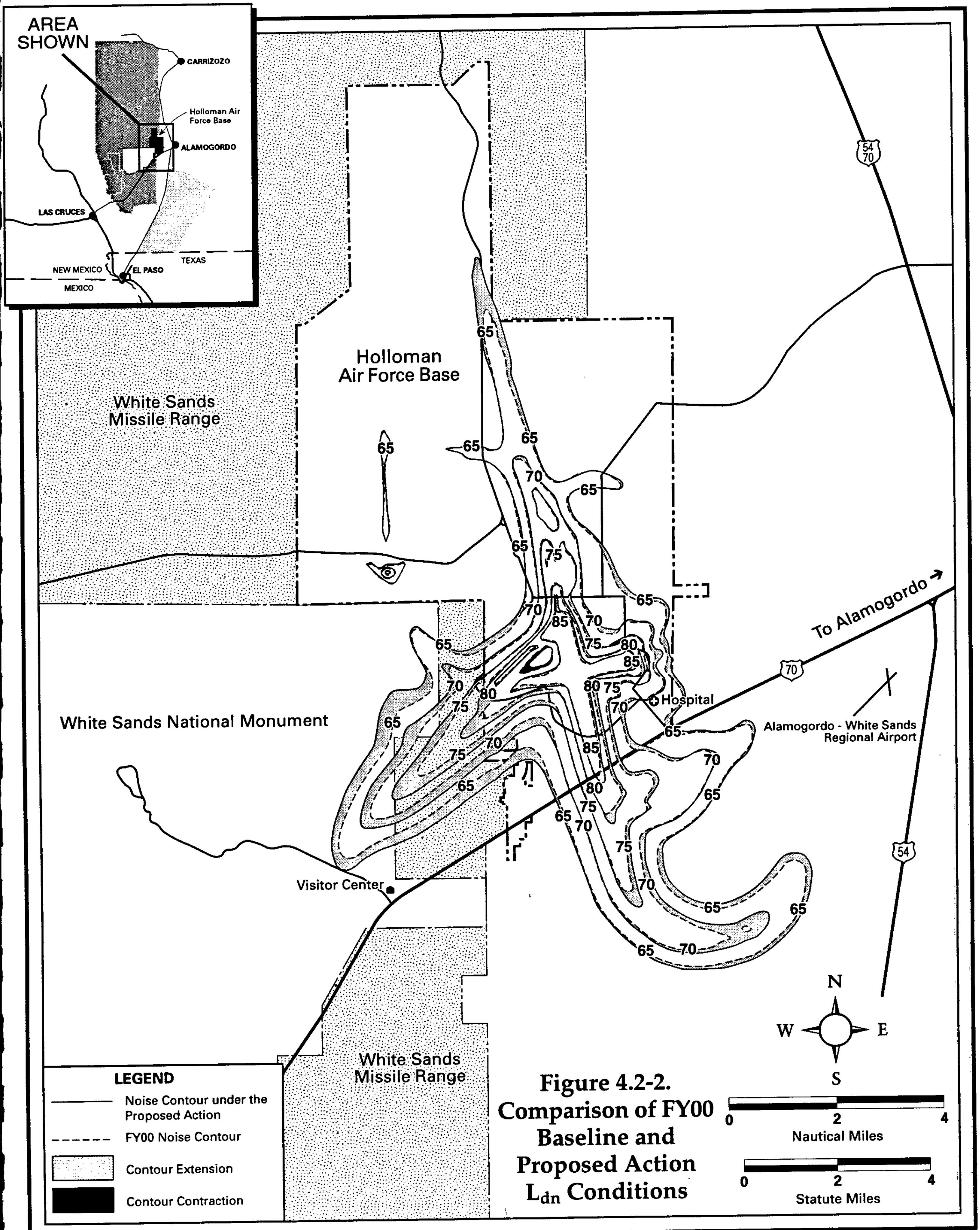

Figure 4.2-2. Comparison of FY00 Baseline and Proposed Action L_{dn} Conditions

complexes. Establishment and use of these facilities would not affect sound levels in these areas.

4.2.1.2 Impacts Common to NTC Training Options

The information given in this EIS consists of cumulative analyses. In terms of cumulative impacts, other MOAs and/or MTRs that intersect, overlap, and/or coincide with an affected airspace unit are included in the analysis of noise levels for the proposed action. This approach results in cumulative L_{dnmr} levels that account for both the GAF Tornado aircraft and other military aircraft activity that would occur within the airspace boundaries. Aircraft operational data used for calculating noise levels include aircraft types, hours of operation, power settings, speeds, duration, altitude profiles, and sorties. Thus, this approach results in the presentation of the highest L_{dnmr} values expected for the proposed action.

A comparison of noise levels for FY00 and the proposed action is presented in Table 4.2-5. Representative noise locations, denoted by noise reference points 1 through 91, were selected for analysis. The 91 reference points are presented graphically in Figure 4.2-3.

Under the proposed action, the cumulative L_{dnmr} can range from a low of 35 dB to a high of 63 dB. A noise level of 65 dB is the benchmark most often applied when determining residential land use compatibility around airports. The highest noise levels are located under the Restricted Areas overlying Oscura and Red Rio impact areas and Melrose and McGregor Ranges, under Talon Low MOA, and under MTRs IR-133, IR-134/195, and IR-192/194. Table 4.2-5 presents the change in noise level as measured in reference to baseline conditions.

The proposed action includes approximately 24 supersonic sorties per year. These sorties are carried out to meet aircraft maintenance requirements and would be conducted in the WSMR supersonic airspace. About 2,900 supersonic sorties are flown annually in this airspace. The number of sorties under the proposed action is less than one percent of this amount. From a noise perspective, the increase in supersonic sorties is considered negligible.

4.2.1.3 Impacts Specific to the West Otero Mesa Training Option

For the Final EIS, based on comments received, an effort was made to improve the presentation of the noise modeling results to make it clearer and easier to interpret. To facilitate the presentation of this material, a new graphic has been introduced in place of a table to illustrate the variation in the noise levels within McGregor Range.

McGregor Range and the associated restricted airspace is presently used for air-to-air and air-to-ground training. These activities are randomly distributed throughout the McGregor airspace. Several MTRs cross through the area or terminate inside the range boundaries. Aircraft activity on these MTRs is concentrated along the

Table 4.2-5. Change in Onset Rate Adjusted Day-Night Average Sound Level (L_{dn}) Due to the NTC Training Options Compared to FY00 Baseline Conditions

Reference Points	Sound Level FY00 Baseline (dB)	Sound Level NTC Options (dB)	Change (dB)
1	55	56	1
2	62	62	0
3	50	51	1
4	61	62	1
5	42	42	0
6	42	44	2
7	50	53	3
8	57	58	1
9	39	39	0
10	59	59	0
11	39	39	0
12	48	48	0
13	48	51	3
14	47	52	5
15	47	47	0
16	46	46	0
17	47	50	3
18	49	50	1
19	63	62	-1
20	54	50	-4
21	57	60	3
22	47	53	6
23	37	38	1
24	49	49	0
25	49	51	2
26	53	56	3
27	47	50	3
28	55	56	1
29	57	58	1
30	51	54	3
31	56	57	1
32	54	54	0
33	53	53	0
34	51	54	3
35	51	54	3
36	49	55	6
37	49	54	5
38	51	57	6
39	56	57	1
40	56	59	3
41	53	53	0
42	47	50	3
43	56	56	0
44	56	56	0
45	36	37	1
46	39	43	4
47	39	43	4
48	39	43	4
49	38	42	4
50	46	46	0
51	35*	35*	0*
52	35*	35*	0*
53	35*	35*	0*
54	47	50	3
55	35*	35*	0*
56	50	54	4
57	47	53	6
58	49	56	7
59	35*	35*	0*
60	54	54	0
61	42	42	0
62	45	47	2
63	52	52	0
64	50	53	3
65	53	54	1
66	45	46	1
67	38	38	0
68	45	45	0
69	46	49	3
70	35*	35*	0*
71	54	54	0
72	41	47	6
73	47	53	6
74	48	54	6
75	51	53	2
76	37	38	1
77	49	49	0
78	56	59	3
79	44	51	7
80	35*	35*	0*
81	54	56	2
82	39	40	1
83	48	48	0
84	55	56	1
85	35	35	0
86	52	53	1
87	40	42	2
88	35*	35*	0*
89	35*	35*	0*
90	35*	35*	0*
91	39	41	2

* Reference point located outside region of aircraft noise. Assume a background noise environment of 35 dB.

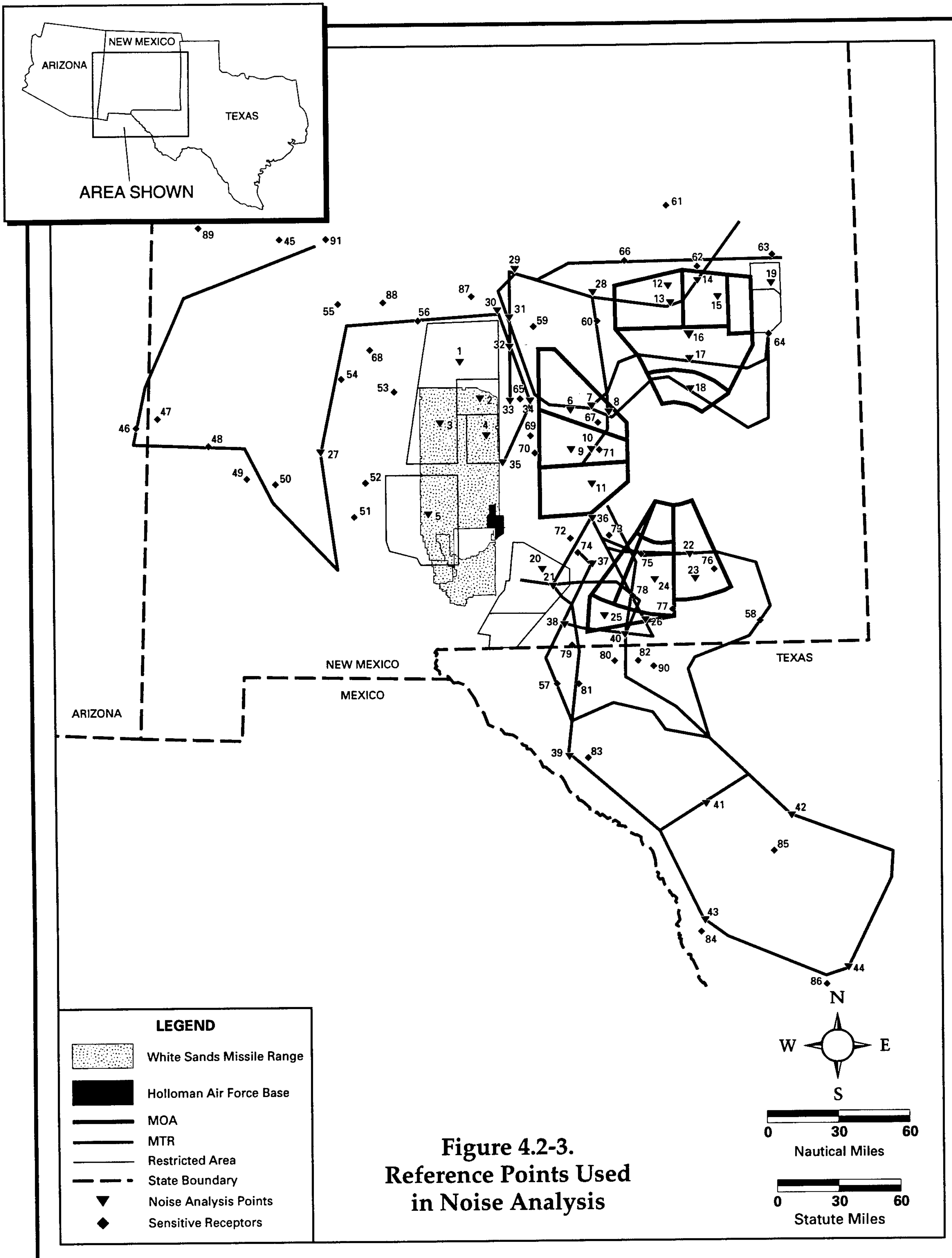

**Figure 4.2-3.
Reference Points Used
in Noise Analysis**

centerlines of the routes, and drops off laterally with distance from the centerline following a Gaussian distribution. Overall, the distribution of noise associated with projected baseline operations (FY00) is relatively homogenous over the range (about 54 dB L_{dnmr}), with slightly higher (57 dB) noise levels in the vicinity of the MTRs.

Under the proposed action, much of the aircraft activity for McGregor Range and its associated restricted airspace would be focused on the NTC. Figure 4.2-4 depicts representative training patterns flown by the GAF for the West Otero Mesa site. Other military users of the NTC would use various other patterns during munition delivery runs. Most of the aircraft would not follow the pattern precisely, but would be narrowly distributed by a Gaussian distribution about the pattern centerline. For analytical purposes, each sortie to the NTC was assumed to have eight passes over the NTC, distributed almost evenly between four different bombing patterns. Most of the flight patterns would be flown at an altitude of 1,500 feet AGL, with some variation, depending on the weapon delivery tactic. Sound levels in the immediate vicinity of the impact area would reach an estimated 80 dB (L_{dnmr}). Away from the impact area, but under the centerline of the bombing patterns, sound levels would range from 61 to 63 dB L_{dnmr}. As illustrated in the insert "cutaway" view in Figure 4.2-4, noise levels would drop off rapidly with distance from the centerline. Elsewhere within McGregor Range and its associated restricted airspace, noise levels would typically range from about 49 dB to about 55 dB, with some elevation (55 to 63 dB) in the vicinity of the MTRs. This figure represents the cumulative sound level, averaged over a 24-hour period. Overall, most areas outside but in the immediate vicinity of the boundaries of McGregor Range would experience sound levels at or near background. Some areas to the southwest, underlying the bombing patterns, as shown in Figure 4.2-4, would receive noise levels up to 63 dB. In these cases, sound levels would drop to baseline levels within one NM of the centerline of the bombing pattern.

4.2.1.4 Impacts Specific to the Tularosa Basin Training Option

Aircraft operations at the Tularosa Basin NTC site would be constrained by the presence of the Otero Mesa escarpment to the east. As a result, the flight patterns that would be used under this NTC training option (see Figure 4.2-5) would be different from those for the West Otero Mesa site. This would result in a larger area exposed to aircraft sound levels because the flight patterns would be substantially longer. Given that the number of operations and the training tactics used on the Tularosa Basin NTC would be the same as under the West Otero Mesa training option, the lateral distribution of the sound levels would be the same for both options. The noise levels directly under the bombing patterns would be similar to those for the West Otero Mesa training option, ranging from about 57 dB L_{dnmr} to about 63 dB. Noise levels above the impact area, where the individual flight patterns converge, would be about 80 dB. Elsewhere within McGregor Range and the associated restricted airspace, sound levels would generally range from about 49 dB to 55 dB. This figure represents the cumulative sound levels (averaged over a 24-hour period); therefore, somewhat higher sound levels (55 dB to 63 dB) would result

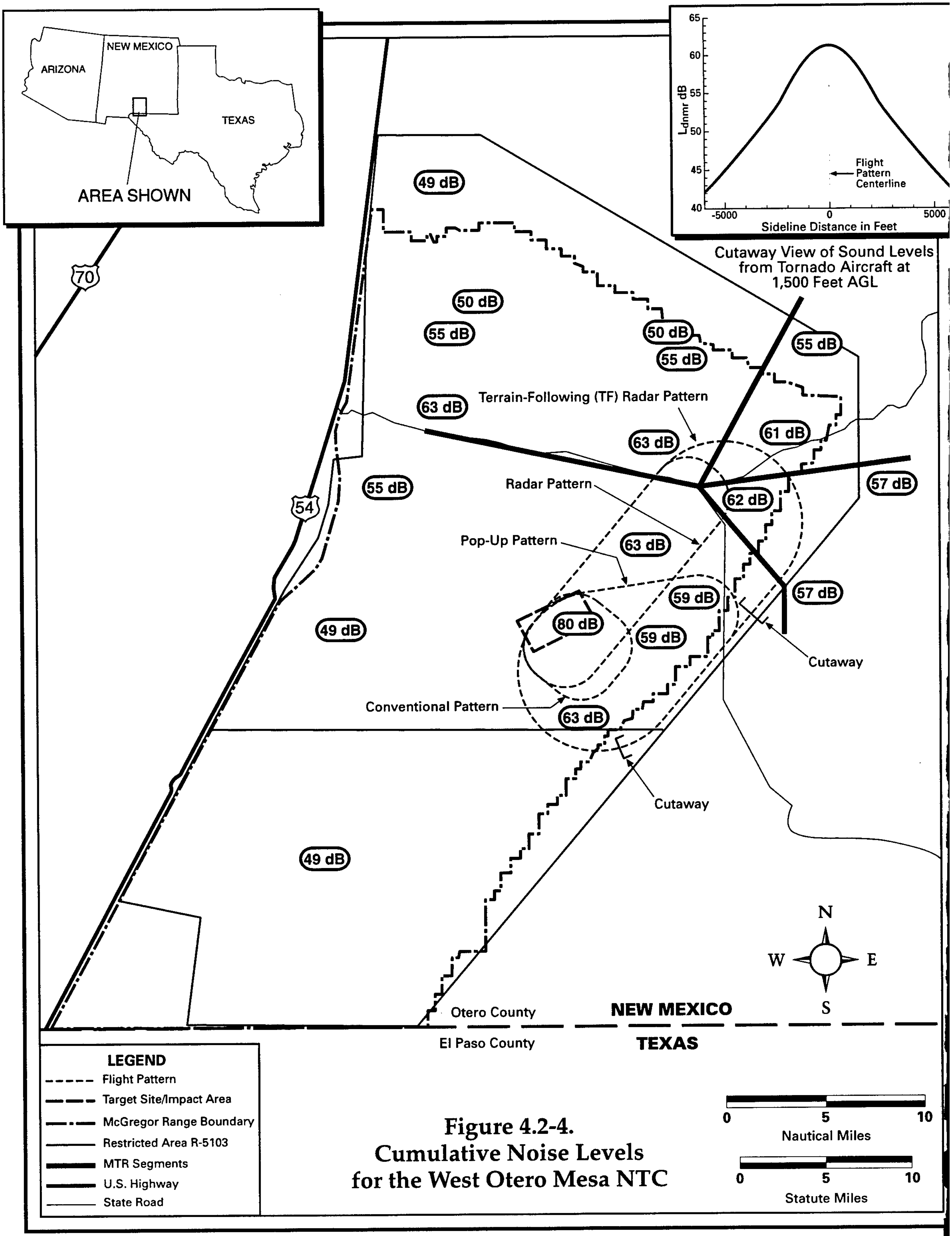

**Figure 4.2-4.
Cumulative Noise Levels
for the West Otero Mesa NTC**

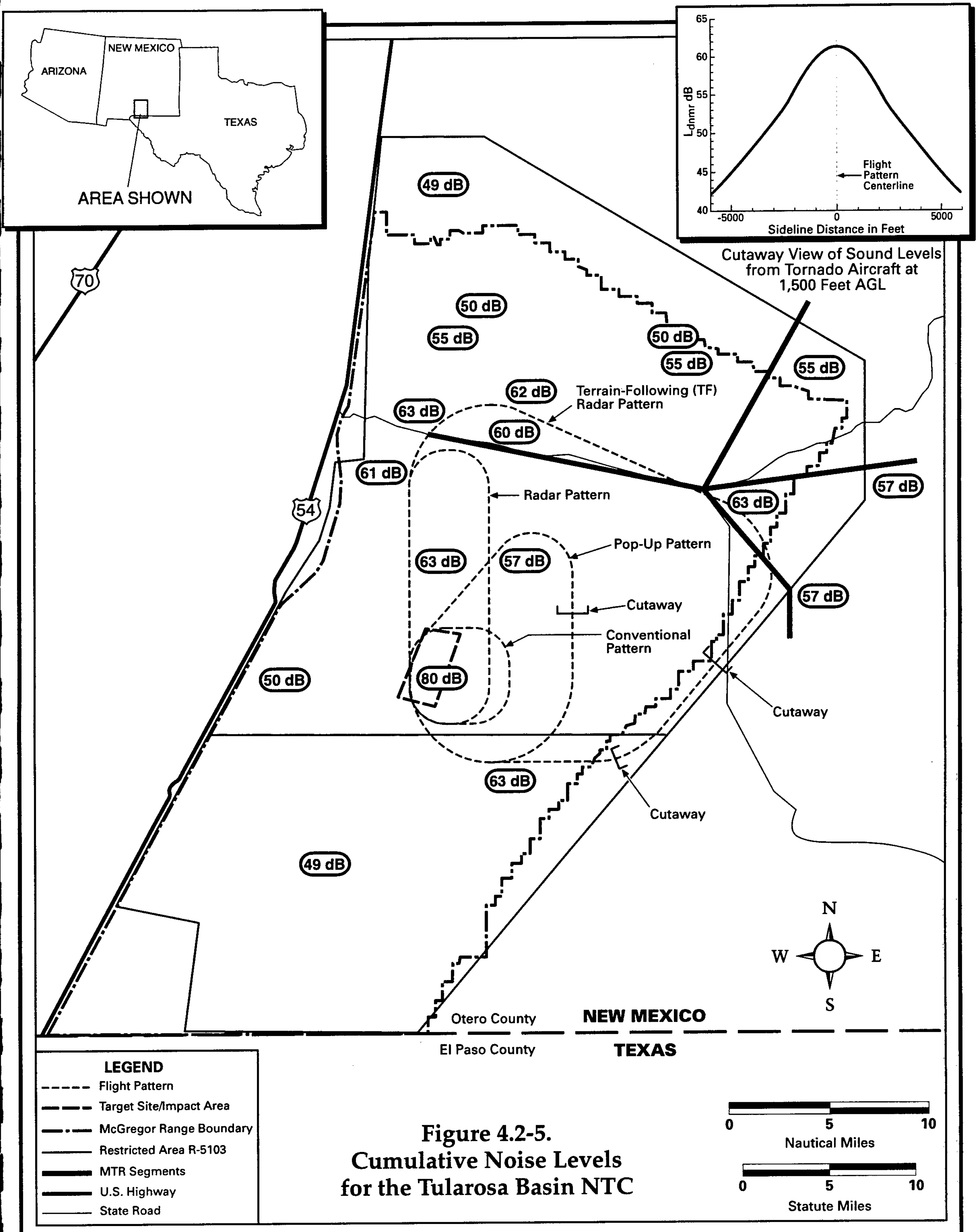

Figure 4.2-5.
Cumulative Noise Levels for the Tularosa Basin NTC

in the area immediately under the MTR corridors. Overall, most areas outside but in the immediate vicinity of the boundaries of McGregor Range would experience sound levels at or near background. Some areas to the southwest, overflown by the bombing patterns, as shown in Figure 4.2-4, would receive noise levels up to 63 dB. In these cases, sound levels would drop to baseline levels within one NM of the centerline of the bombing pattern.

4.2.1.5 Impacts Specific to the Existing Range Training Option

Projected noise levels for the Existing Range training option are presented in Table 4.2-6. Under the Existing Range training option, the L_{dnmr} could range from a low of 35 dB to a high of 64 dB. All of the noise levels calculated by MRNMAP were less than or equal to 64 dB. The highest noise levels are located under Melrose, Oscura, and Red Rio restricted airspace.

Melrose Range is both a conventional and tactical range. A conventional range is flown with published patterns that typically enter the range from the same direction each time the pattern is flown. Typically, a tactical range can be approached from any direction and the airspace above the range is flown so that the operations are randomly distributed within the restricted airspace boundaries. In the event that the Existing Range training option is implemented, there would be added to the 8,744 operations scheduled in FY00 a total of 1,457 Tornado operations per year, which represents a 17 percent increase in the number of operations (see Table 2.1-12). This increase in the number of operations would result, at most, in a 1 dB increase above the FY00 noise levels environment at the range, which would not be perceptible for the average listener. For Melrose Range, some restrictions apply for tactical range approaches from the west. Figure 4.2-6 presents the patterns that are flown at Melrose Range. Note that the TFR pattern extends beyond the Melrose Range restricted airspace. Because of the combination of a tactical and conventional range, the noise level on the range will be on average 64 dB within the R-5104/5105 restricted airspace boundary, with levels as high as 80 dB near the impact area.

4.2.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have a minimal effect on noise levels, as discussed below, for the NTC and Existing Range training options. The overall assessment of noise conditions under the proposed action would remain unchanged.

NTC Training Options. In the event that the ALCM/Talon action is not implemented, airspace use would differ from that examined for the NTC training options. Taking these differences into account would affect noise levels for most airspace by less than 1 dB. The exceptions to this are R-5103, R-5107, VR-176 Long,

Table 4.2-6. Changes in Onset Rate Adjusted Day-Night Average Sound Level (L_{dnmr}) (Existing Range Training Option Compared to FY00 Noise Levels)

Reference Points	Sound Level FY00 Baseline (dB)	Sound Level Existing Range (dB)	Change (dB)
1	55	56	1
2	62	62	0
3	50	51	1
4	61	63	2
5	42	42	0
6	42	47	5
7	50	59	9
8	57	58	1
9	39	39	0
10	59	59	0
11	39	39	0
12	48	48	0
13	48	57	9
14	47	59	12
15	47	47	0
16	46	46	0
17	47	57	10
18	49	52	3
19	63	64	1
20	54	54	0
21	57	56	-1
22	47	46	-1
23	37	38	1
24	49	49	0
25	49	49	0
26	53	52	-1
27	47	52	5
28	55	59	4
29	57	61	4
30	51	56	5
31	56	59	3
32	54	56	2
33	53	53	0
34	51	56	5
35	51	55	4
36	49	47	-2
37	49	47	-2
38	51	49	-2
39	56	56	0
40	56	53	-3
41	53	50	-3
42	47	43	-4
43	56	56	0
44	56	55	-1
45	36	37	1
46	39	43	4
47	39	43	4
48	39	43	4
49	38	42	4

Reference Points	Sound Level FY00 Baseline (dB)	Sound Level Existing Range (dB)	Change (dB)
50	46	46	0
51	35*	35*	0*
52	35*	35*	0*
53	35*	35*	0*
54	47	51	4
55	35*	35*	0*
56	50	55	5
57	47	45	-2
58	49	48	-1
59	35*	35*	0*
60	54	55	1
61	42	42	0
62	45	50	5
63	52	53	1
64	50	58	8
65	53	55	2
66	45	47	2
67	38	38	0
68	45	45	0
69	46	51	5
70	35*	35*	0*
71	54	54	0
72	41	40	-1
73	47	45	-2
74	48	46	-2
75	51	50	-1
76	37	38	1
77	49	49	0
78	56	54	-2
79	44	42	-2
80	35*	35*	0*
81	54	52	-2
82	39	38	-1
83	48	48	0
84	55	56	1
85	35	35	0
86	52	53	1
87	40	42	2
88	35*	35*	0*
89	35*	35*	0*
90	35*	35*	0*
91	39	41	2

* Reference point located outside region of aircraft noise. Assume a background noise environment of 35 dB.

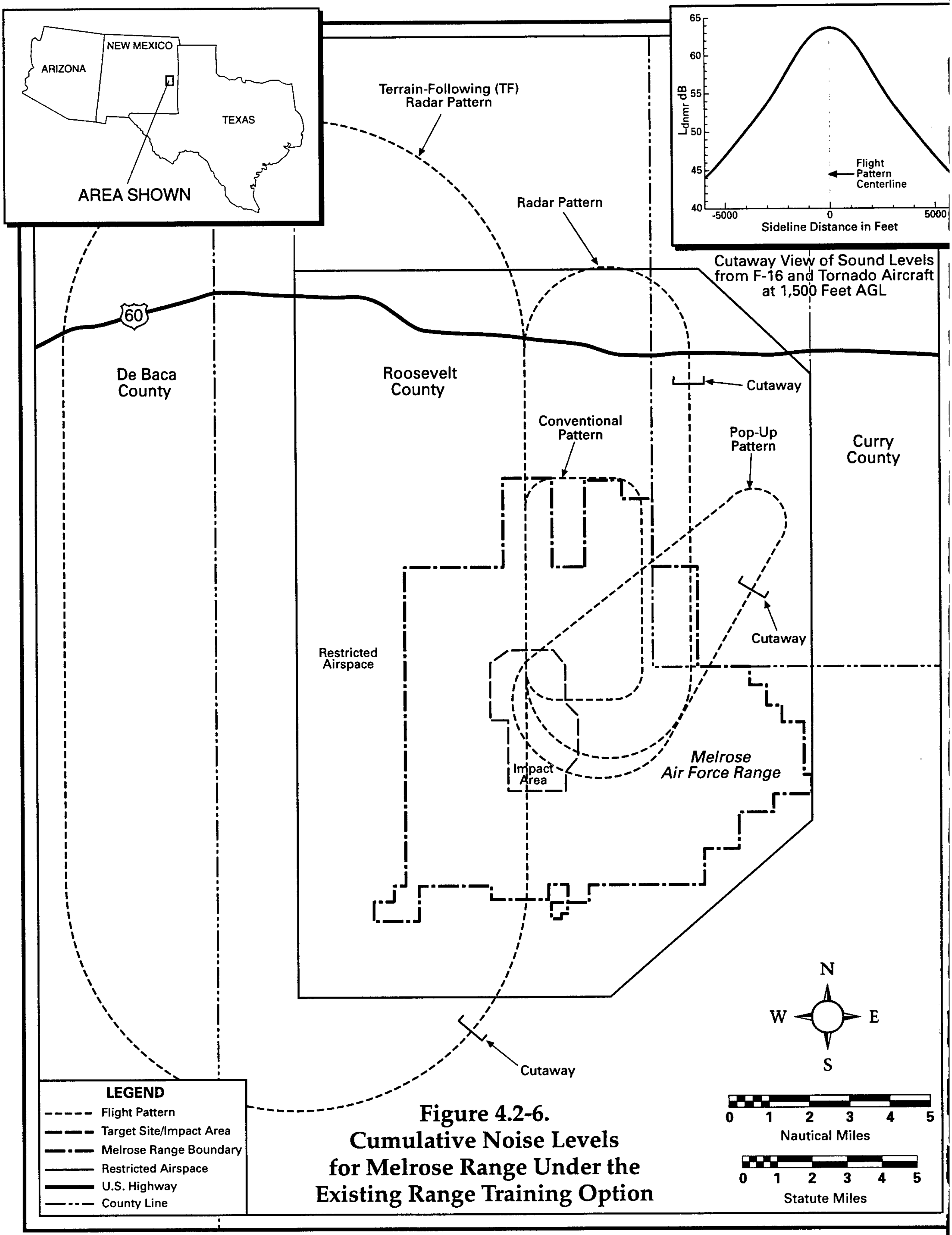

Figure 4.2-6. Cumulative Noise Levels for Melrose Range Under the Existing Range Training Option

and IR-192/194. Shown in Table 4.2-7 are the expected increases in noise levels over projected conditions. For example, consider R-5107 represented in Table 4.2-5 by reference point 5, which has a noise level of 42 dB (L_{dnmr}). If the aircraft operations are redistributed, then the noise levels in R-5107 would increase by 4 dB, resulting in a new level of 46 dB.

Existing Range Training Option. In the event that the ALCM/Talon proposed action is not implemented, airspace use would differ from that examined in the foregoing analysis. Taking these differences into account would affect noise levels for most airspace by less than 1 dB. The exceptions to this are IR-192/194, VR-176 Long, and R-5107. Shown in Table 4.2-8 are the expected increases in noise levels under projected conditions. For example, consider R-5107, represented in Table 4.2-6 by reference point 5, which has a noise level of 42 dB (L_{dnmr}). If the aircraft operations are redistributed, then the noise levels in R-5107 would increase by 4 dB, resulting in a new level of 46 dB.

4.2.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in activities at Holloman AFB, at any existing range, or within any existing airspace (regardless of the availability of IR-102/141 or Talon Low MOA). As a result, this alternative would have no adverse effect on noise conditions in any area.

4.3 LAND USE

Effects on land use may result from construction and use of facilities supporting the beddown of additional GAF aircraft at Holloman AFB, and from noise generated by aircraft operations at Holloman AFB and within affected airspace. Under the preferred training option (West Otero Mesa NTC), impacts to land use from these sources are discussed in the following sections. Overall, construction activity at Holloman AFB and on existing ranges would have no effect on existing land uses. Changes in aircraft operations within the Holloman aerodrome would increase noise levels at the base and in the immediate surrounding area. No appreciable increase in noise exposure for on-base housing or community services would be expected. At White Sands National Monument, the amount of recreational area exposed to noise levels between 65 and 75 dB would increase. Projected noise level changes due to proposed use of other airspace (MTRs, MOAs, and Restricted Areas) would be expected.

4.3.1 Proposed Action

4.3.1.1 Impacts Common to All Training Options

Holloman AFB. Under the proposed action, several construction activities would take place at Holloman AFB. In general, new construction would be located within

Table 4.2-7. Change in L_{dnmr} Noise Levels if ALCM/Talon Action is not Implemented (Proposed Action)

Airspace	Change in Sound Level (dB)	
	FY00 Baseline	Proposed Action
R-5107	4	4
R-5103	4	0
VR-176	1	3
IR-192/194	2	3

Table 4.2-8. Change in L_{dnmr} Noise Levels if ALCM/Talon Action is not Implemented (Existing Range Training Option)

Airspace	Change in Sound Level (dB)	
	FY00 Baseline	Existing Range Option
R-5107 (Yonder)	4	4
VR-176 Long	1	6
IR-192/194	2	4

the developed areas of the base with functions similar to those proposed. No change in land use would be expected to result from this construction. A new munitions storage area supporting GAF operations would be located in open space adjacent to and immediately south of the existing munitions/weapons storage area. The setbacks for the proposed munitions storage area would fall within the setbacks for the existing storage area. These setbacks, which are based on munition quantity and type considerations, are established for safety purposes. Consequently, the existing easement for the munitions storage area (which is required to prevent encroachment by construction of new inhabited structures in areas adjacent to the base boundaries) would not require any modification (Sandoval, 1997).

The proposed action would use roughly 300,000 cubic yards of sand and 400,000 cubic yards of gravel for on-base construction. These materials would be purchased from local commercial suppliers. Sand and gravel are abundant within the region. The above limited quantities would not deplete availability for other users in the region.

Changes in operations at the Holloman aerodrome under the proposed action would result in an increase in the area encompassed by the L_{dn} 65 dB noise contour, relative to the FY00 baseline. This increase would affect an area totaling about five square miles. Locations within the cantonment area would experience minor increases over projected FY00 conditions. Most areas newly affected by noise levels of 65 dB and above are located in undeveloped parts of the base, within Clear Zones, or within areas used for mission-related activities, and therefore would be minimally affected by noise increases. Noise levels in some portions of the residential and non-mission-related areas of the base would increase by 1 to 3 dB.

Off-base areas exposed to noise levels of L_{dn} 65 dB and greater would increase by 3.47 square miles over FY00 (16 percent). About 0.14 square mile (90 acres) of privately owned (undeveloped) land would be newly affected by these noise levels. Areas south and southwest of Holloman AFB would experience the greatest increase in noise exposure under the proposed action, both in loudness (amplitude) and extent (area). The area exposed to L_{dn} 65 dB and greater at White Sands National Monument would increase by less than two square miles. This represents less than one percent of the monument area. Areas that are tentatively identified for a new campground on the monument would experience increases in noise of about 1 to 4 dB. Portions of this area would be newly exposed to levels of 65 dB and above under the proposed action.

Operational procedures at Holloman AFB are designed to avoid as much as possible overflight of the adjacent monument headquarters. These procedures include avoidance of direct overflight of the monument headquarters below 2,000 feet AGL within one NM.

Most of the land outside the monument and WSMR exposed to noise levels of 65 dB and above is used for cattle grazing. Most of this area is south of U.S. 70; the maximum change in noise level in this area is about 3 dB. Under the proposed

action, this area would continue to be compatible with cattle grazing. Coordination of AICUZ conditions at the base with local planning officials would reduce the potential for future incompatible off-base development or encroachment.

Oscura and Red Rio Target Complexes. Installation or construction of TOSS components at Oscura and Red Rio target complexes would be wholly contained within the boundaries of WSMR. These activities would be small in scale and would have no potential for affecting land use, either within the boundaries of WSMR or elsewhere.

Affected Airspace. Land underlying any of the specific MTRs, MOAs, or Restricted Areas affected by the proposed action could experience changes in overflight or noise conditions. While the impacts to land use due to such changes are specific to the training option being considered, some generalizations regarding issues common to all training options can be made.

Under all training options, sensitive land uses, protected areas, and rural residents are located under the affected airspace. It should be noted that aircraft must avoid congested areas and settlements by 1,000 feet AGL and 2,000 feet laterally and isolated persons, vessels, or structures by 500 feet in accordance with AFI 11-206 (U.S. Air Force, 1994b) and Federal Aviation Regulation Part 91.119 (FAA, 1992). GAF pilots would also have to fly in accordance with similar GAF regulations, which are more restrictive than U.S. Air Force regulations. In addition, some sensitive locations or protected areas, such as communities, national parks, or protected wildlife areas have been identified for avoidance by specific lateral and/or vertical distance. These avoidances are listed in published route descriptions and are intended to reduce noise exposure and safety risks from military aircraft overflight. The noise calculations in Section 4.2 do not include these avoidance standoffs; as a result, noise levels at some specific locations would be lower than those projected in this analysis.

Throughout the southern half of New Mexico and west Texas there are isolated animal breeding and dairy farms. Annual surveys of MTRs identify locations of facilities and structures for avoidance to reduce potential disturbance to noise-sensitive activities. In addition, when identified by private owners or operators, airspace managers can include appropriate avoidance procedures for specific locations.

Grazing. Public comments for the DEIS indicated concerns about the possible impact of the proposed action on ranching operations in the affected area. In recent years, a variety of factors have strained the economic viability of ranching operations, including: reduced grazing allotments; lowered beef prices; drought; increased regulatory and administrative requirements of federal land managers; stiffer loan qualification requirements for ranchers; and reduced risk tolerance by lenders. The cumulative effect of these factors has substantially affected small ranching operations throughout the West. Ranchers expressed concern that additional

impacts from the proposed action or training options could severely affect the local cattle industry. While this is partially an economic issue (see Section 3.9), it is possible that changes in the viability of ranching operations could affect the suitability of land for grazing in the affected area. The following presents a generalized discussion of possible impacts of overflight under all training options on ranching operations and land use in the affected area. This general analysis considers (a) possible impacts of aircraft overflight in general, and (b) specific effects of the use of existing ranges.

<u>Aircraft Overflight.</u> Under all training options, aircraft would overfly extensive rangeland areas used for cattle ranching on low-level MTRs. Several concerns and potential effects associated with aircraft overflights include:

- loss of cattle productivity due to startle effects of low-flying aircraft;
- disruption of ranching operations from startling of cattle, causing them to disperse, particularly during roundups, or to run into fences, causing injury;
- additional risk to ranchers who may be thrown from startled horses;
- loss of grazing land and/or access to perform ranching activities.

In general, the effects of proposed changes in aircraft operations in MTRs and MOAs on cattle and ranching operations would be similar to present and past conditions. This conclusion is based on the following:

- Cattle responses to low-level jet aircraft are generally short-term and do not result in measurable disruption to grazing, or changes in population numbers, or habitat use (see Appendix J for additional information).
- Use of most airspace would be generally similar to use under FY00 baseline (with few exceptions), resulting in no significant change in exposure to noise events. The projected baseline use in FY00 would be similar to past levels in many areas. Grazing (as a land use) and ranching operations have not historically been curtailed by overflights throughout the West. Many routes have been used for several decades, and past levels of use have been both lower and higher than those proposed. Based on experience in areas that have been historically overflown, grazing in areas that would experience relatively new exposure to low overflight are not anticipated to be significantly affected.
- The probability of any specific animal being overflown more than once a day would be low due to the distribution of sorties and cattle over a large area. Overflights are anticipated to be most frequent in areas between and around Willard, Duran, and Carrizozo where historic sortie levels have been greater than those currently proposed. Current combined operations of overlapping routes in this area include 15 to 16 day sorties and four to five night sorties per

week. The maximum use for this area under the proposed action could be 19 to 20 day and about four night sorties per week. Within the past 10 years, annual operations on MTRs in this area have been both higher and lower than levels proposed, with cumulative levels being within the range of current and proposed cumulative levels.

- Incidents of cattle dispersing during roundups may occasionally occur, but they are not expected to be any greater regionally than previously experienced. Similarly, there is potential for horses to be startled. These kinds of events are likely to continue to be incidental. In some cases, avoidance of facilities or seasonal activities can be coordinated with local airspace managers to minimize potential conflicts.

Air-to-Ground Training. Air-to-ground training would also continue to a greater or lesser degree at existing ranges where cattle operations occur. Potential concerns and effects associated with cattle grazing at air-to-ground training ranges could include:

- safety risks to cattle and ranchers from ordnance (debris and UXO), and from ordnance during training periods that may not stay contained within impact areas;
- constraints on access for performing livestock maintenance activities;
- potential for damage to livestock facilities or infrastructure (such as water tanks); and,
- loss of production and disruptions from low aircraft overflight (similar to aircraft overflight issues identified above).

In order to evaluate these particular issues, grazing activities at existing air-to-ground ranges were examined to see whether ranching operations were compatible with military uses.

Under all training options, air-to-ground training would occur at Melrose Range and at Red Rio and Oscura impact areas. Of these three areas, cattle ranching operations occur only in the immediate vicinity of Melrose Range; thus, no impact on ranching operations could be expected for use of either Red Rio or Oscura impact areas. Cattle currently graze within the safety area at Melrose Range, up to the edge of the 10,000-acre impact area. Under none of the training options would there be a change in the area where grazing would be permitted, or in access for ranchers at Melrose Range. Any effect on ranching operations would arise through increased use of the range (overflight and munitions use). Past experience at Melrose Range indicates that grazing is compatible with military operations. Grazing is not permitted within impact areas, but is allowed in surrounding safety areas. The U.S. Air Force is unaware of any injuries or fatalities to cattle or ranchers from military activities at Melrose Range (Crowe, 1997a). Access to livestock on the range is restricted to early mornings, but affected ranchers have been able to maintain viable operations.

Grazing Operations at Other Air-to-Ground Ranges. Review of grazing operations at other air-to-ground ranges (e.g., Saylor Creek Range in Idaho, and Avon Park Range in Florida) yields similar findings. Saylor Creek Range is comprised of 109,000 acres of withdrawn land. While grazing is not permitted in the 11,000-acre impact area, about 7,000 AUMs are allocated annually on the surrounding 98,000 acres, and additional temporary non-renewable allocations are usually available every year. At this air-to-ground range, ranchers provide and maintain all improvements, water and waterlines, and fences, and can be on grazing lands at any time. There have never been any injuries to cattle or ranchers from military operations in the withdrawn lands of Saylor Creek Range. No specific incidents of damage were identified (Byer, 1997).

Avon Park Range in central Florida encompasses approximately 106,000 acres. Grazing is not permitted within the impact areas of the target complexes, but is permitted within the safety area. A total of 93,000 acres (88 percent) of the range is actively used for grazing, supporting about 4,000 head of cattle annually, on nine units leased to eight lessees. The land is leased by the acre at an average cost of about $2 per acre for native forage areas, and about $10 per acre for improved rangeland. There are no restricted hours of operation for ranchers, who generally can obtain access through Range Control at any time. No ranchers have ever been injured by military activities. No cattle have been injured since an incident in 1993 when several cattle were killed. Including this event, there has averaged about one cattle fatality each year over the last 20 years (Penfield, 1997).

Based on the continuing success of existing livestock operations at air-to-ground ranges, grazing is a compatible activity. Potential risks from ordnance, varying conditions on access, and possible inconvenience to ranching operations do not appear to have lessened suitability of these lands for this use.

4.3.1.2 Impacts Common to NTC Training Options

Areas underlying MOAs, MTRs, and Restricted Areas can be affected by changes in military airspace operations, both through the physical occurrence of overflight and through the resulting noise. On an annualized basis, most non-DOD-owned or controlled areas underlying airspace affected by the proposed action would receive less than about two additional sorties per day. Areas underlying VR-176 (combined Long and Short routes), IR-134/195, Talon MOA, and R-5107 would receive up to about four additional sorties per day while McGregor Range (R-5103) would receive about 11 additional sorties per day. In some locations, overlap of airspace would result in greater increases in overflight than that projected for individual airspace elements. For example, overflight in some areas north of Carrizozo in central New Mexico would increase by about five sorties per day due to concentration of operations of several overlapping MTRs within a 20 NM corridor. Communities in this area are specially avoided by lateral distances of one-half mile or more or a minimum vertical distance of 1,000 feet in accordance with AFI 11-206 (U.S. Air

Force, 1994b), so effects of overflights on residential and other noise-sensitive land uses are reduced.

Because the various affected airspace units overlap in a complex manner, it is difficult to precisely quantify the changes in sortie numbers that would be experienced in any given area underlying the airspace. The noise analysis, however, directly includes the effects of overlapping airspace, and also takes into account differences in overflight altitude as well as patterns of aircraft distribution. Changes in the day-night average noise levels (e.g., as measured by the L_{dnmr} metric) provide a better index of overflight than can be obtained by simple estimates of overflight frequency. Most areas would experience increases in noise of between 1 and 3 dB over FY00 conditions. Noise increases of 2 dB or less would be imperceptible, while noise increases of 3 dB would be potentially noticeable to persons using or residing in the area. Several areas would receive noticeable increases in noise levels of 5 to 7 dB in Otero and Eddy counties in New Mexico, and Hudspeth and Culberson counties in west Texas under several flight corridors (IR-102/141, IR-134/195, IR-192/194, VR-100/125, and IR-133) and Talon MOA. Some rural residents may be annoyed by low overflights and increases in noise in areas that are characteristically quiet. When identified by private owners or operators, airspace managers can include appropriate avoidance procedures for specific locations.

Table 4.3-1 summarizes impacts related to changes in airspace use for specific land uses in terms of both overflight and noise.

In response to several comments on the Draft EIS concerning potential impacts to recreation and Wilderness Areas, the following discussion has been included. Several Wilderness Areas underlie MTRs that would be used under the proposed action. These areas, like many Wilderness Areas and national parks and monuments across the United States, are exposed to varying conditions of aircraft overflight. The most common types of overflight result from firefighting and management activities by federal agencies, low-level, high-speed military overflights, and commercial overflights for tourism.

Under the National Park Overflight Act of 1987 (PL 100-91), a series of studies and reports have addressed issues and potential impacts from aircraft overflights on wilderness resources. In a *Report to Congress* prepared by the U.S. Forest Service in 1992, few adverse impacts to wilderness users were found to result from aircraft overflight of Forest Service-managed Wilderness Areas. The report indicates that low-altitude, high-speed military aircraft were the most annoying due to their startle effect. However, these overflights are generally infrequent; therefore, they are not encountered by most visitors. The majority of respondents to surveys did not feel that aircraft overflights adversely impacted their recreational experience or would influence their plans to return to an area. Data did indicate that wilderness users are less tolerant of aircraft noise than residential populations.

Table 4.3-1. Land Use Impacts for the NTC Training Options

Land Use Manager	Land Use Management Area	Airspace	Change from Baseline FY00	Impact Evaluation
USFS*	Portion of Lincoln National Forest including Capitan Mountain Wilderness	IR -113, IR-133, and VR-100/125	Increase of from 1 to 3 dB.	No impact on recreational and resource use.
	Guadalupe Rim, Guadalupe District of the Lincoln National Forest.	IR-102/141, IR-134/195 Talon Low MOA	Increase to 18 daily sorties from 10 daily.	Infrequent, short-duration flights could cause annoyance to some recreationists.
	National Forests and Wilderness Areas in southwestern NM and eastern AZ	VR-176	No appreciable change in overflights; noise levels at or below 50 dB.	Infrequent, short-duration flights could cause annoyance to some recreationists.
NPS	Guadalupe Mountains National Park (access road)	IR-192/194	Noise levels on fringe of route corridor remain low (below L_{dnmr} 40 dB).	No impact on access road.
	Salinas Pueblo Missions National Monument (Gran Quivira unit)	IR-113, IR-133, and VR-100/125 and VR-176	Increase daily sorties from 16 to 20. Less than 1 dB increase. Use special operating procedures to avoid overflight.	Noise levels are not projected to adversely affect monument users.
	El Malpais and Gila Cliff Dwelling National Monuments	VR-176	Increase from 3 to 7 sorties per week from two to three per week.	MTR corridor width of 20 to 40 NM dispersed overflights; no effect on land use.
	Guadalupe Escarpment and Lonesome Ridge WSA	Near alternate exit for IR-192/194 and IR-134/195	Occasional use. No appreciable change in noise over ambient levels.	No impact to park users or recreationists.
	Carlsbad Caverns National Park and Wilderness Area	IR-134/195 (adjacent)	Increase of 3 sorties per day from 1 per day. No direct overflight.	Infrequent, short-duration flights could cause annoyance to some wilderness users.
USFWS	Areas specifically designated for wildlife protection (San Andres, Bosque del Apache, and Sevilleta NWRs)	VR-176 and R-5107	No change in ambient noise level at San Andres and Bosque del Apache NWRs; 4 dB increase at Sevilleta NWR.	Low impacts to wildlife. No land use impacts.
BLM*	Continental Divide WSA, and El Malpais National Conservation Area	VR-176	Increase of between 3 to 7 sorties per week from 2 to 3 per week. Overflights dispersed over route width would remain extremely infrequent.	Infrequent annoyance to some visitors but, overall, no effect on land use.

Table 4.3-1. Land Use Impacts for the NTC Training Options (continued)

Land Use Manager	Land Use Management Area	Airspace	Change from Baseline FY00	Impact Evaluation
BLM* (continued)	Little Black Peak WSA, Sierra de Las Canas WSA, Valley of Fires Recreation Area, Carrizozo Lava Flows WSA, and Three Rivers Petroglyphs ACEC	VR-176	Increases of 1 or 2 dB (imperceptible); up to 7 daily.	Imperceptible changes in noise environment would result in no discernible impacts. Overflights distributed over a wide area.
	Brokeoff Mountains WSA	IR-134/195, IR-102-141, Talon MOA	Increase of up to 4 dB for some portions; noise levels can reach 58 dB in some areas.	No effect on recreational or resource land use. Limited or potential annoyance to individuals.
	White Mountain Wilderness Area and Three Rivers Petroglyphs Recreation Area	VR-176	Increase of 2 to 3 dB; noise levels at or below 49 dB.	Change in noise not expected to adversely affect the area. Infrequent overflights may annoy some recreationists.
	Wind Mountain, Alkali Lakes, and Cornudas Mountain ACECs	IR-102/141	Increase of about 2 dB.	Infrequent use of these areas and relatively minor changes in noise not expected to adversely affect these areas.
	Alamo Mountain ACEC.	IR-192/194	Increase of about 6 dB; noise levels at or below 53 dB.	Overflights may annoy some recreationists.
NAR	Mescalero Indian Reservation	VR-176 and Beak MOAs	Use of airspace increases one sortie per day to a total of seven. Noise levels would not exceed 40 dB for most areas.	Existing and continued overflights could disturb recreational users or those pursuing traditional activities.
	Laguna, Acoma Pueblo, Alamo-Navajo, Ramah-Navajo, and Zuni Reservations	VR-176	No significant change from current conditions.	No discernible impacts.
DOD Lands	Oscura and Red Rio Impact Areas on WSMR	R-5107B	Little change in sorties. Noise level around 62 dB at Oscura impact area.	No impact on land use within WSMR or off-range land uses or travel along Highway 380.
	Melrose Range	R-5104/R-5105	Noise levels of about 62 dB; continued heavy use of the range with about 30 day sorties and three to four night sorties.	Noise levels compatible with agricultural activity on DOD and surrounding lands. Some small communities and rural residents in the area could continue to be affected by overflights.

Table 4.3-1. Land Use Impacts for the NTC Training Options (continued)

Land Use Manager	Land Use Management Area	Airspace	Change from Baseline FY00	Impact Evaluation
Other Federal Lands	Very Large Array in west New Mexico	VR-176	About two added sorties daily continue to avoid by a minimum of 500 feet (vertical and lateral distances).	No impacts on scientific use are anticipated.
State Land	State lands in New Mexico and Texas	Various operations	Noise increases are within the acceptable range for land uses.	Proposed air operations would be compatible with the economically viable activities of the region.
	Monuments and State Parks, including Brantley Lake, Living Desert Zoological, Elephant Butte, and Percha Dam	Various	No perceptible increases in noise above ambient levels.	No significant noise impacts. Conditions for most locations would not affect suitability or change uses.
	Sumner Lake State Park	IR-113 and VR-100/125	Increases of 2 dB over the lake (imperceptible); noise levels remain very low at 47 dB.	No noise impacts to land use.
	North edge of Chinati Mountain Property	IR-102/141, IR-178	No discernible increase in noise.	No effect on recreational use.
Private Land*	Privately owned lands, isolated homesteads, ranches converted to emu and ostrich or private hunting and dude-ranch vacationing	VR-100/125, IR-113, VR-176, IR-133, and others	Occasional increase in overflights; 1,000 feet AGL over urban areas, and 500 feet in nonurban areas.	Inadvertent overflights of rural residents could occur. Elevated noise over locations being used for or converted to noise-sensitive enterprises can be undesirable.
	South Otero County in the vicinity of Pinon, Timberon, and Elk. Private ranch lands southwest of Artesia. Areas east of Carlsbad and areas around Willard, Claunch, and White Oaks north of Carrizozo	IR-102/141 VR-100/125, IR-113, and IR-133 IR-192/194	Noticeable increase of about 6 dB to around 54 dB Minor increase over FY00 baseline; noise levels to between 55 and 58 dB Noticeable increase of 6 to 7 dB to around 56 dB	Noise levels compatible with urban residential setting. Annoyance likely due to noticeable rural increases. Noise levels compatible with residential use. Some individual annoyance due to continuing noise levels in rural area. Noise levels compatible with urban residential setting. Annoyance likely due to noticeable rural increases. Avoidance could reduce noise levels.

Table 4.3-1. Land Use Impacts for the NTC Training Options (continued)

Land Use Manager	Land Use Management Area	Airspace	Change from Baseline FY00	Impact Evaluation
Private Land* (continued)	Communities in central NM including Duran, Vaughn, Arabela, and Ancho.	VR-100/125, IR-113, and IR-133	Increase of about 1 to 3 dB; noise levels between 55 and 59 dB	Noise levels compatible with residential use. Possibility for some annoyance.
	West Texas communities including Sierra Blanca, Cornudas, Lobo, Warwick, Haymond, Hovey, and Kent	IR-102/141 and IR-178	Imperceptible increase over FY00 baseline; noise levels between 50 and 57 dB	Noise levels are compatible with land uses. Possibility for some annoyance.

*The dB levels provided here are conservatively overstated. Noise calculations are based on charted minimum altitudes along MTRs and do not account for overflight restrictions of structures by 500 feet in rural areas or 1,000 feet in urban areas. Noise levels for MTRs generally reflect centerline levels where the distribution of sorties is greatest and noise level is highest. Therefore, noise levels at ranches and homesteads would generally be lower than indicated.

A similar report was prepared by the NPS in 1995 (*Report on Effects of Aircraft Overflight on the National Park System*). Natural quiet and natural scenery, regarded as important park resources by the NPS, were considered reasons for visiting parks by most surveyed visitors (over 90 percent). The study addressed potential effects of overflights on natural quiet and visitor enjoyment. Annoyance from aircraft overflights correlated to both increased duration of audible aircraft noise and loudness (averaged over one hour). The study also found that persons hiking backcountry and camping away from park facilities were much more likely to hear aircraft noise and to find that it interfered with natural quiet than persons engaged in other activities at parks or associated Wilderness Areas. About half of those backcountry visitors who heard aircraft noise were annoyed by it and found it interfered with their enjoyment. Other visitors who heard aircraft noise were less likely to be annoyed or to experience decreased enjoyment compared to backcountry visitors.

Under the NTC training options, no Wilderness Areas would be newly overflown. Sorties on VR-176 Short, which overlies Apache Kid, Withington, and White Mountains Wilderness Areas, would increase from an average of about four or five per day to about seven per day. Some areas that have historically been overflown under VR-176 Long (including Gila, Aldo Leopold, and Blue Range Wilderness Areas) are extremely remote and have outstanding qualities of solitude and natural quiet. Sorties on VR-Long would increase from about two per week to three or four per week. Portions of Capitan Mountains Wilderness Area underlie part of three MTR corridors (IR-113, IR-133, and VR-100/125). Aggregated sorties on these routes would increase from about 13 to 19 per day. For any given location on the ground, a sortie may be heard for about one minute. The loudness of the sound and its duration depend on the aircraft's distance from the listener. Several other factors influence the audibility of aircraft events by persons (or animals) on the ground, including altitude, engine type, power setting, speed of the aircraft, and the ambient noise level.

Table 4.3-2 provides an estimate of the duration that military aircraft might overfly various Wilderness Areas on an average day, if the aircraft overflies the longest dimension of each Wilderness Area underneath the MTR at an airspeed of 520 miles per hour. It should be noted that sorties are dispersed over the route corridors and that none of the underlying Wilderness Areas span the entire width of overlying MTR corridors. Because of this, not every Wilderness Area would be overflown by every sortie. Some sorties may only fly over a small portion of an underlying Wilderness Area, in which case the duration of the overflight would be less than shown in Table 4.3-2.

Incidents of overflight where noise levels are substantial would be infrequent, particularly relative to the small number of users of extremely remote areas. While this does not preclude occasional annoyance and impaired enjoyment for some outdoor recreationists, it would not significantly alter the context and preponderance of natural quiet in these areas. Use of IR-134/195 would increase

Table 4.3-2. Potential Duration of Aircraft Overflight in Underlying Wilderness Areas (NTC Training Options)

Wilderness Area	MTR[1]	Length (miles)[2]	Duration/ sortie (minutes)[3]	Average duration/day FY00 (minutes)[4]	Average duration/day NTC training options (minutes)[4]
Blue Range	VR-176 Long	23	3	1	2
Gila	VR-176 Long	55	6	3	5
Aldo Leopold	VR-176 Long	28	3	1	2
Withington	VR-176 Long, Short	7	1	4	6
Apache Kid	VR-176 Long, Short	14	2	7	11
White Mountains	VR-176 Long, Short	13	2	7	11
Capitan Mountains	IR-113, IR-133, VR-100/125	16	2	22	25

Notes:

1. Overlying MTR corridor
2. Longest dimension of underlying Wilderness Area.
3. Based on length (distance) traveled, at 520 miles per hour. Rounded to nearest whole number.
4. Based on average number of sorties per day in overlying MTR(s). Rounded to nearest whole number.

from an average of about one to four sorties daily, increasing the potential for noise exposure from single aircraft events within the adjacent MTR on the western edges of the Carlsbad Caverns Wilderness Area. Similarly, aircraft flying on the edge of VR-176 Long in western New Mexico could be heard in El Morro National Monument. Low use of VR-176 Long (about two per week with a maximum of seven sorties per week if the ALCM/Talon action is not implemented), combined with dispersion of these operations over a very wide route width, would make nearby overflight extremely infrequent. The extreme northern portion of Big Bend National Park is within 2.6 miles of IR-102/141. Aircraft flying at the edge of the MTR may sometimes be audible in the park, but L_{max} would not exceed 66 dB. In all three of these National Park Service locations, proposed aircraft activity would not contribute measurable increases over current noise levels.

Average noise levels over Wilderness Areas may increase by 1 to 4 dB under the proposed action. Resulting noise levels over most areas would remain extremely low (around L_{dnmr} 43 dB or less) over the Blue Range Wilderness and Primitive Areas, Gila, and Aldo Leopold Wilderness Areas. Capitan Peak would experience no increase over the current level of L_{dnmr} 38 dB, although fringes of the Wilderness Area may have slightly higher (up to about L_{dnmr} 40 dB) average noise levels. Similarly, neither Carlsbad Caverns nor Guadalupe Mountains Wilderness Areas would be affected by any increased noise over current ambient levels. Withington and Apache Kid Wilderness Areas underlying VR-176 Short would experience increases of 3 dB, resulting in maximum average noise levels of L_{dnmr} 50 dB in portions directly under the route centerline.

If the proposed restructuring and use of IR-102/141 and modifications to Talon MOA are not implemented, additional aircraft operations on IR-192/194 would result in more frequent overflights and slightly higher noise levels over those anticipated for the proposed action (about 1 dB increase), mostly in portions of Culberson and Hudspeth counties, west Texas, and Eddy County, New Mexico, that underlie the route. Similarly, increases of about 2 dB over proposed action levels would be expected for areas underlying VR-176 Long, but would remain low at L_{dnmr} 45 dB or below. One or two overflights daily would be distributed over the width of this portion of the route.

4.3.1.3 Impacts Specific to the West Otero Mesa Training Option

Under the West Otero Mesa training option, the NTC would be located on withdrawn land within McGregor Range (see Figure 2.1-11). Withdrawn lands are Federal lands that were set aside by Congress for military use, under MLWA (PL 99-606). The 5,120-acre impact area, located within the portion of McGregor Range where grazing and limited public access are permitted, would be fenced and all public access excluded. Access to State Road 506 would not be changed by operation of the NTC. It is anticipated that training would restrict access to areas south of State Road 506 for approximately 60 hours each week. Access by ranchers to grazing areas for livestock activities and by the public for recreation would generally be

unconstrained by air-to-ground activity from Friday afternoon through Sunday each week and early mornings on weekdays. Each year, the NTC would be closed for about one month for cleanup activities, allowing increased access to areas that are usually closed during training.

Construction and use of the NTC would not directly affect management responsibilities defined in the MOU between the U.S. Army and BLM for the withdrawn lands. Reduced access time would make it more difficult to accomplish some management tasks. For example, access to areas south of State Road 506 would be reduced due to closure during training periods. This could constrain BLM's maintenance of damaged water pipelines. However, existing pipelines within the impact area would be relocated so that they would not be affected by use of the NTC. Any interruption of water supply during this relocation process would be of short duration and should not affect water supply for wildlife and livestock in the area.

Licensed deer and antelope hunting would continue to be scheduled on McGregor Range through coordination between NMDGF and the U.S. Army. Fencing around the 5,120-acre impact area would allow game to pass through. However, hunters would not be permitted in this area due to possible risks from ordnance debris. It is possible that the success of individual hunters could be affected if antelope or deer are within (or run into) the 5,120-acre area where access would be restricted during a hunt.

It is unlikely that proposed target complex activities would appreciably change herd sizes; therefore, it is not anticipated that the number of licenses issued would be affected. Although the Army anticipates that these hunts could continue as they have in the past, NMDGF would review the location of any new target area to determine if any further restrictions would be required. If it were decided that the McGregor Range portion of Antelope Management Unit 29 would no longer be hunted, a maximum of 20 antelope hunters (under current allocations) would be affected.

Since deer hunting by the public is only permitted north of State Road 506 (Unit 28), and neither the impact area nor safety area for an NTC would extend into this area, there would be no effect to public deer hunting on McGregor Range, but possible reduction in deer hunting for DOD personnel in areas south of State Road 506.

Effects to bird hunting would be minimal since game bird opportunities are not good on Otero Mesa (Bankston, 1997) and access to preferable areas north of State Road 506 would not be constrained by training at an NTC on west Otero Mesa.

Access by groups and individuals to observe wildlife and enjoy nature would be allowed within safety areas (but not the 5,120-acre impact area) when the target complex is not in use. During weekdays, availability of areas south of State Road 506 for any recreational use would be limited to early morning hours. Currently, these

areas are occasionally available for recreational use during the week. Because most training is performed during the week, there would be few restrictions for these recreational activities on weekends due to this action, when the demand is likely to be highest. However, other activities scheduled by the Army, including environmental management, may curtail access on weekends. Access to the ACEC on the range would be restricted while the NTC is in use, but there would continue to be times available to perform conservation activities.

Culp Canyon WSA would not be affected by construction activities. Use of airspace overlying Culp Canyon WSA would not be expected to disturb or alter the features or physical resources of the underlying area. Due to existing and potential impacts from military uses, this area is currently not recommended for wilderness designation. A characteristic noise level of about 55 dB (L_{dnmr}) for R-5103 B/C as a whole under the NTC training options, compared to baseline conditions of 54 dB would cause imperceptible changes in noise conditions in the WSA. This overall noise level assumes that aircraft activity within McGregor Range is dispersed throughout R-5103. In fact, activity would be concentrated on flight patterns around the NTC and would tend to reduce aircraft overflight in the north part of the airspace over Culp Canyon WSA. Potential effects on backcountry users are discussed in Section 4.3.1.2. Noise from overflights would not result in permanent impairment of qualities of naturalness but may be temporarily annoying to some recreationists.

Noise levels within R-5103 would be as high as L_{dnmr} 80 dB over the NTC. These levels would be compatible with livestock uses under AICUZ guidelines. During times when the NTC would be in use, portions of the range within the safety area would be restricted; therefore, the potential for exposure of persons to these noise levels would be reduced.

Similar levels would be experienced on private property east of the range directly under the flight patterns that would be used for NTC operations, and would be compatible with cattle grazing, the dominant land use. One residence in this area is located about one statute mile from the centerline of the proposed pattern to be used by aircraft at the NTC. Noise levels over this residence would be L_{dnmr} 43 dB. This would be compatible with residential use.

In response to local concerns and planning process, the U.S. Air Force has met with Otero County Commissioners and members of the county's Public Land Use Advisory Council (PLUAC) on over six occasions between December 1996 and September 1997 to provide information on U.S. Air Force plans and proposals and to accept input. In addition, the U.S. Air Force has also met with local ranchers and community members to discuss issues related to this proposal.

The Otero County Interim Land Use Plan identifies preservation of the custom and culture of Otero County citizens through guiding the use of public lands and resources and protecting the rights of private property owners as its primary goal.

The proposed location for the NTC on west Otero Mesa would be contained within existing federal, military-use areas in Otero County, and would not involve acquisition of private property. A primary concern of the County Commissioners and PLUAC is availability of public land for a variety of customary uses identified in Section 3.3.1.4. Effects on these uses are summarized below.

Training activities at the proposed NTC would not alter use of existing water resources or water rights nor result in additional closure of State Road 506, which provides access to U.S. 54 for citizens to the east and north of McGregor Range. Because this area is not suitable for crop or timber/wood production, these customary uses would not be affected.

Comments on the Draft EIS indicate concern about the effect of the proposed action on mineral resources of value to the county and region. The following summarizes the potential impacts on mineral uses. The proposed action would require the use of approximately 29,000 cubic feet of gravel for road construction at the NTC on Otero Mesa. The material may be purchased from local commercial suppliers or obtained from sources on McGregor Range. Sand and gravel are abundant both on the range and within the region (Jensen, 1998), and relatively small quantities for this project would not deplete availability for other users in the region. Source locations for materials on withdrawn land or from other public land areas could be obtained from existing borrow or quarry sites or new locations that would be coordinated with the appropriate land manager. Remediation of temporary borrow sites would minimize potential for visual impacts or soil erosion. Because the economic value of mining industrial materials depends largely on transportation costs, sources on McGregor Range have limited potential for use beyond the immediate environs.

Concern about effects of military uses on future exploration and development of minerals was expressed during the public comment period on the Draft EIS. The Army does not currently permit any minerals exploration or use on McGregor Range; therefore, development of an NTC would not affect any ongoing minerals exploration. Further, use of the NTC would not affect the long-term value or accessibility of mineral resources. Because of the low potential for metallic minerals on McGregor Range, there is likely to be little interest in exploration for these minerals in the foreseeable future. However, since the recent gas discovery to the east of McGregor Range, oil companies have expressed interest to BLM in future exploration on McGregor Range (Sanders, 1998). Under the proposed action, oil and gas exploration and production would not be permitted within the two-by-four mile impact area of the NTC due to the high probability of impacts from ordnance. Minerals exploration in the safety area would constrain approaches used by aircraft for specific targets at the NTC. Access would not be allowed within the safety area for drilling or maintenance activities during training periods. Therefore, there would be restrictions on oil and gas exploration in the safety area. Locations beyond the safety area would not be constrained by proposed NTC activities (Hoppes, 1998). Areas identified in the Mineral Assessment for McGregor Range as having moderate potential for oil and gas resources on McGregor Range do not coincide

with the proposed NTC safety area. New equipment and facilities under 50 feet in height would not constrain proposed training. Facilities or equipment over 100 feet in height would not be allowed within flight patterns and approaches of aircraft using the NTC. Airspace users should be advised of any new obstructions within the Restricted Area, which is cleared for use to the surface (Hoppes, 1998).

Effects on other valued land resources and activities of Otero County include potential effects on threatened and endangered biota, addressed in Section 4.5, and potential loss of cultural resources, addressed in Section 4.6. Access for recreation would be reduced under this training option. Considering the current low level of public use, reduced availability for recreational use would have insignificant effects. The West Otero Mesa site would have little effect on the county's policy supporting multiple-use objectives of public lands under the Public Rangeland Improvement Act. Effects on grazing practices are addressed below. Therefore, overall it would not be inconsistent with the goals and objectives of county plans.

Grazing. In addition to those described in Section 4.3.1.1, specific concerns have been identified related to proposed construction and use of a target complex on west Otero Mesa that could affect ranchers and viability of ranching operations. These include:

- reduction in grazing land and grazing allotment;
- reduction in access to perform cattle management and maintenance activities, including timely mending of leaking or damaged water pipelines, resulting in interrupted delivery of water for cattle;
- reduced access to corrals and infrastructure;
- additional risk to ranching operations;
- permanent loss of use of grazing land due to accumulation of ordnance debris;
- loss of unique rangeland, both for its high-quality grazing and research opportunities on the economics of competitively bid grazing lands; and
- loss of taxes and revenues to Otero County.

Selection of the West Otero Mesa site would convert 5,120 acres of grazing land on Otero Mesa to exclusive military use. This represents less than two percent of the area available for grazing on McGregor Range. Of this, 3,015 acres of grazing unit 9 (comprising about 9.7 percent of the grazing unit) and 2,115 acres of grazing unit 13 (comprising 10.6 percent of the grazing unit) would no longer be available for grazing. Total available AUMs would be reduced by about 450 per year (based on current allocations), or two percent of annualized AUMs currently under contract on McGregor Range. Over the last five years, the number of AUMs put up for auction on McGregor Range have fluctuated by up to 4,500 AUMs more or less than

current allocations in response to forage conditions. This would be a reduction of less than 0.2 percent of AUMs generally available in Otero County. Even though grazing on McGregor Range is considered good quality due to water availability, the overall reduction in grazing land would be minimal.

The two affected grazing units would still remain viable and could continue to be auctioned. A reduction of 29 cattle in unit 9 and 21 in unit 13 (based on current allocations) would have minimal impact on the mostly larger-scale ranch operations (with over 250 head of cattle) of the ranchers who hold contracts on McGregor Range units. Grazing unit 9 would continue to support 271 head of cattle (rather than 300), and unit 13 would support 229 (rather than 250) head. Because of the changing custodianship of units on McGregor Range, there is not a situation in which one or two individual ranchers are continually dependent on the status and structure of these two particular units. Thus, the reductions would not necessarily be borne by any particular individual over time.

During training periods, rancher access into portions of grazing units within the safety area would not be permitted for up to 60 hours each week. Use of the West Otero Mesa impact area would restrict access to 22,285 acres in grazing unit 9 (72 percent), 2,252 acres in grazing unit 10 (49 percent), 2,273 acres in grazing unit 11 (13 percent), 8,000 acres in grazing unit 12 (100 percent), 19,910 acres in grazing unit 13 (100 percent), 1,351 acres in grazing unit 14 (68 percent), and 2,395 acres in grazing unit 15 (18 percent). It is likely that ranchers and BLM would only be able to perform their tasks during prescribed times, mostly in the early mornings and on weekends. This may be inconvenient to ranchers, particularly since driving times to units on Otero Mesa are lengthy.

It is expected that BLM would continue to provide a range of services to grazing lessees, minimizing the amount of time that ranchers need to spend tending livestock. Access to grazing areas north of State Road 506 would not be affected by proposed operations at a target complex. However, restricted access for BLM employees to grazing areas within the safety areas could interfere with BLM's range management functions. These impacts could be:

- reduced flexibility for performing work in the safety footprints;
- less frequent monitoring of pipelines and therefore higher risk of less timely repairs; and
- difficulty in coordinating adequate blocks of time for moving cattle on and off the range during key periods.

Most management activities in the grazing areas south of State Road 506 would have to be conducted during early mornings, late afternoons, and weekends. It should be possible to accomplish necessary tasks in this time frame if BLM's three-person team works together, but there would be less flexibility to split the team up to

work independently in different locations. Coordination between the U.S. Air Force, Range Control, and BLM employees is being examined to maximize access into grazing areas at other times during the week. Current biweekly monitoring of pipelines may not be possible if work in the safety areas is concentrated into a three-day period. It may not be possible to survey pipelines south of State Road 506 in three-hour periods that would generally be available every morning before training begins. When repairs are needed on pipelines, BLM personnel could be scheduled to accomplish the work, minimizing disruption of water supplies to cattle and wildlife. Access to facilities such as Mesa Horse Camp, Mary Toy corral, and End of the Line corral that support cattle operations both within and outside the safety footprints would be possible every morning. While this may not be optimal, it would allow for some daily use.

Moving cattle on and off grazing units within the safety footprints requires several sequential days in October, March, and July. If adequate blocks of time can not be regularly scheduled during these months, this could interfere with seasonal livestock activities at affected grazing units south of State Road 506. Although inconvenient, logistical issues can be mostly resolved through coordinating training schedules with seasonal and daily livestock operations. Actions to reduce adverse effects could include the following:

- expand BLM's range management team to allow more work to be accomplished on weekends and to make up for lost access during the week;

- complete water pipeline replacement program to minimize potential for leaks and disruption to water supplies and to reduce time required for maintaining old pipeline;

- construct additional accessible corrals outside the safety footprint;

- establish additional equipment storage areas in key locations to minimize time needed for repairs and maintenance of grazing infrastructure (pipelines, fences, corrals) south of State Road 506;

- improve selected range roadways to provide access outside the safety footprints to grazing areas that can currently only be effectively reached by transiting through the footprint;

- coordinate training requirements among the U.S. Air Force, BLM, and Ft. Bliss to minimize conflicts between all agencies' requirements and objectives;

- provide "real-time" communication between the U.S. Air Force, BLM range management team, and Range Control to maximize access into grazing units within the safety footprints between training periods and in the event of cancellations by Holloman units; and

- conduct range cleanup activities when the impact area is inactivated, to coincide with periods when ranchers move cattle on or off the grazing units.

Based on the experience of cattle operations at other air-to-ground ranges (including Melrose Range, Saylor Creek Range, and Avon Park), grazing within safety footprints has not resulted in injuries to cattle or ranchers from ordnance use. It is possible for ordnance to fall within the safety footprints, but these areas would be cleared periodically to preclude accumulation of debris or UXO. Ranchers would be briefed about potential hazards, and procedures would be included in grazing or access permit contracts to ensure safety. Because the U.S. Air Force would periodically clear the safety areas, there would be nothing to preclude future public uses of the land.

Overall, effects on grazing from development of a target complex on west Otero Mesa would be limited. Calculations indicate that impacts to the economic viability of ranching operations would not be significant (see Section 4.9, Socioeconomics). Agreements and procedures would be established by the U.S. Army, Air Force, and BLM to provide access for cattle operations.

4.3.1.4 Impacts Specific to the Tularosa Basin Training Option

The 5,120-acre Tularosa Basin site for the NTC is within the existing impact area of McGregor Range; as such, it has been closed to public access since its withdrawal. The Tularosa Basin impact area has been used heavily by the Army for many years and is not currently suitable for general public use due to hazardous debris and potential UXO throughout this area. Construction and use of the NTC at this location would not displace any existing grazing leases on McGregor Range. However, use of this site would result in restricted access for public recreation, to portions of grazing units 9 (about 800 acres, or three percent) and 13 (about 5,560 acres, or 28 percent), and the ACEC along the Otero Mesa escarpment that would be within the safety footprint during training periods. Because the impact area would be located in an area that is unavailable for grazing, there would be no reduction in AUMs under this training option. Hunting activities in grazing unit areas would not be affected and would continue to be coordinated between NMDGF and Fort Bliss Range Control. Access to portions of grazing units 9 and 13 for recreation and nature observation would be limited for about 60 weekly hours (Monday through Friday) by U.S. Air Force activities. Because all existing grazing units would remain available, use of this site as an NTC would not conflict with Otero County's policies on grazing as stated in the Interim Land Use Plan. Noise levels from aircraft operations using the Tularosa Basin site over privately owned land east of McGregor Range would be similar to those described for the West Otero Mesa training option.

Construction of roads on the NTC at the Tularosa Basin site would require approximately 11,000 cubic feet of gravel. This quantity of gravel would have similar effects on gravel use as described for the West Otero Mesa training option.

Exploration and development of minerals for the Tularosa Basin NTC would parallel that for the West Otero Mesa training option. Current use of this area as a safety area for munitions firings and possible historic use of an impact area would constrain mineral resource development until areas were cleared of safety hazards and UXO. Most of the land area within the safety area would continue to be unavailable for mineral use due to the high level of use of this area for military operations.

Under the Tularosa Basin training option, the target impact area would not be on land currently used for grazing. Therefore, there would be no reduction in the area available for grazing. Access to portions of grazing units 9 (three percent, or 800 acres) and 13 (28 percent, or 5,560 acres) within the safety footprint would be restricted during training periods. Access to the primary corrals on Otero Mesa would not be affected. Access to less than five percent of the water pipeline on McGregor Range would be restricted during training operations. This is not expected to significantly affect grazing or the economic viability of ranching operations on McGregor Range or in Otero County.

4.3.1.5 Impacts Specific to the Existing Range Training Option

Land use impacts for areas underlying affected airspace would be similar to those discussed for the NTC training options. Some areas would experience substantially greater aircraft activity under the Existing Range training option. Activity on IR-133 and VR-100/125 would increase slightly. Sorties on VR-176 Short would double, while IR-113 would experience three times as much activity as in FY00. VR-176 Short would be flown by about nine sorties daily. IR-113 would be flown by seven daytime sorties per day and IR-133 would be flown by six daytime sorties.

Generally, areas where noise increases would be most noticeable are located where these routes overlap, in central and east-central New Mexico. Overall, noise levels under MTRs and MOAs would not exceed L_{dnmr} 61 dB. However, these levels would be intrusive in rural areas, where indigenous noise levels are low, particularly where increases of 5 dB and greater would be very noticeable. The projected increases of 12 and 10 dB, respectively, under IR-113 and Pecos Low MOA in De Baca and north Chaves counties, would be noticeable. Most underlying areas have extremely low population and are used for cattle grazing; therefore, land use impacts would be minimal. Impacts on individuals and isolated homesteads could occur and would be similar to those described for the NTC training options.

Several routes would experience less use than under the NTC training options, including IR-192/194, IR-134/195, and IR-102/141 (Long and Short), resulting in slightly lower noise levels than under the NTC training options, particularly in southern Otero and Chaves counties, and Eddy County.

Under this training option, several Wilderness Areas (including Withington, Apache Kid, White Mountains, and Capitan Mountains) would have a greater

increase in potential duration of overflight over FY00, compared to the NTC training options. For example, Capitan Mountains Wilderness Area would be potentially overflown 11 minutes more under this option than under the NTC training options. These changes are due to projected increases in average number of sorties per day from combined use of routes overlying the Wilderness Areas. There would be no change in potential exposure for Wilderness Areas under VR-176 Long (Blue Range, Gila, and Aldo Leopold Wilderness Areas). Table 4.3-3 summarizes duration of overflights for this training option. The method and assumptions used to calculate duration are presented in Section 4.3.1.2.

Under this training option, Holloman units would continue to use the existing target on McGregor Range. This represents no change from the FY00 baseline. Overall, there would be no change in conditions affecting land use on McGregor Range.

Table 4.3-4 summarizes impacts related to changes in airspace use for specific land uses in terms of both overflight and noise. Under the Existing Range training option, there would be no change in potential use of McGregor Range for mineral resources or exploration.

Under the Existing Range training option, grazing would continue on existing air-to-ground ranges. No change in access for ranching operations or reduction in grazing areas would result. Therefore, grazing would not be affected by this training option.

4.3.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have a minimal effect on land use, and the above-stated conclusions would remain unchanged.

4.3.2 No-Action Alternative

No change in land use prevailing in FY00 would result from implementation of the No-Action alternative. Conditions would remain the same as projected for the FY00 baseline described in Chapter 3.0.

4.4 AIR QUALITY

The air quality analysis evaluated impacts common to all training options, including emissions from stationary and mobile sources in the Holloman aerodrome, plus impacts from construction and maintenance of the Oscura and Red Rio impact areas. In addition, impacts of emissions from off-base flying

Table 4.3-3. Potential Duration of Aircraft Overflight in Underlying Wilderness Areas (Existing Range Training Option)

Wilderness Area	MTR[1]	Length (miles)[2]	Duration/ sortie (minutes)[3]	Average duration/day FY 00 (minutes)[4]	Average duration/day Existing Range training option (minutes)[4]
Blue Range	VR-176 Long	23	3	1	2
Gila	VR-176 Long	55	6	3	5
Aldo Leopold	VR-176 Long	28	3	1	2
Withington	VR-176 Long, Short	7	1	4	8
Apache Kid	VR-176 Long, Short	14	2	7	16
White Mountains	VR-176 Long, Short	13	2	7	14
Capitan Mountains	IR-113, IR-133, VR-100/125	16	2	22	36

Notes:
1. Overlying MTR corridor.
2. Longest dimension of underlying Wilderness Area.
3. Based on length (distance) traveled, at 520 miles per hour.
4. Based on average number of sorties per day in overlying MTR(s). Durations have been rounded to whole numbers.

Table 4.3-4. Land Use Impacts for the Existing Range Training Option

Land Use Manager	Land Use Management Area	Airspace	Change from Baseline FY00	Impact Evaluation
USFS	Portions of Lincoln National Forest including the Guadalupe Mountains escarpment area.	IR-102/141, IR-134/195, Talon Low MOA	Reduction of one sortie to three sorties per day on MTRs; slight reduction in noise.	No change in land use; slight beneficial effect on recreational users.
	Portions of Withington and White Mountains Wilderness Areas	VR-176	Total of nine sorties per day. Increase in noise levels by 4 to 5 dB from 46 dB to 51 dB.	Potential annoyance to some wilderness users from short-duration flights.
	Portions of Capitan Mountain Wilderness Area	IR -113 and VR-100/125	Increases of 9 dB. Fringes of the area could experience 59 dB.	Potential annoyance to some wilderness users from short-duration flights.
	Blue Range Primitive and Wilderness Areas and portions of Gila and Aldo Leopold Wilderness Areas	VR-176 Long	Increase to four operations per week; overall noise levels remain very low at less than 43 and 46 dB, respectively	Potential annoyance to some wilderness users from short-duration flights.
NPS	Guadalupe Mountains National Park	No direct overflight	Slight decrease in nearby noise levels to about 38 dB.	No impact.
	Gran Quivira unit of Salinas Pueblo Missions National Monument	IR-113, IR-133, VR-100/125, and VR-176	Perceptible increase in noise levels in vicinity. Standard avoidance procedures preclude impacts.	Monument use would not be affected.
	El Malpais and Gila Cliff Dwelling National Monuments	VR-176	Overall noise levels remain very low at less than 43 dB.	Infrequent flights could cause some annoyance to land users.
USFWS	Sevilleta, San Andres, and Bosque del Apache NWRs	VR-176 Short	Increase of 5 dB at Sevilleta NWR to noise levels of 55 dB; no change in noise over San Andres and Bosque del Apache NWR.	No land use impacts; slight potential for effects on migratory birds at Sevilleta NWR.
BLM*	Little Black Peak WSA, Valley of Fires Recreation Area, and Carrizozo Lava Flows WSA (to a lesser extent)	VR-176	Minor increases of 2 dB over portions of areas.	Overflights would be distributed over a wide area and would result in little change in use of these recreational areas. Occasional overflights may annoy some visitors.
	ACECs in southern Otero County	IR-192/194	Potential decreases of up to 2 dB.	No land use effects.

Table 4.3-4. Land Use Impacts for the Existing Range Training Option (continued)

Land Use Manager	Land Use Management Area	Airspace	Change from Baseline FY00	Impact Evaluation
NAR	Mescalero Indian Reservation	VR-176 and Beak MOAs	Imperceptible increase in noise on the northwest fringe.	No effect on recreational uses.
	Alamo-Navajo Reservation	VR-176	Potential slight increase in overflights of the south part of the Reservation; noise levels very low at less than 36 dB.	No effects on land use or those pursuing traditional activities.
Other Federal Lands	Oscura and Red Rio Impact Areas on WSMR	R-5107B	Increased use of Red Rio and Oscura would result in minimal impacts.	Minimal impacts on land use.
	Melrose Range	R-5104/R-5105	Little change to heavily used range.	Imperceptible increase in noise for communities and rural residents.
	Very Large Array in west New Mexico	VR-176	Potential increase of overflights; continue to avoid by minimum of 500 feet.	No effects on scientific use are anticipated.
State Land	Sumner Lake State Park	IR-113 and VR-100/ 125	Noticeable increase of 5 dB due to low overflights over the lake and camping areas; noise levels to 50 dB.	Potential annoyance to some recreationists from infrequent, short-duration overflights.
Private Land*	Privately owned lands, communities, and isolated homesteads	VR-100/125, IR-113, VR-176, and IR-133	Noise levels increase about 5 to 13 dB to between 55 and 61 dB.	Predominant use of private land for cattle ranching activities would be compatible with projected noise levels.
	Areas around Duran, Yeso, northern Lincoln and Chaves, and De Baca counties	VR-100/125, IR-113, and IR-133	Noise levels increase about 5 to 13 dB, to between 55 and 61 dB; number of overflights could double where routes overlap.	Annoyance possible due to noticeable relative increases in rural noise levels. No change in residential use is anticipated.
	Communities in the vicinity of Melrose Range, including Tolar, McAlister, and several scattered ranches in the area	R-5105, R-5104, VR-100/125, IR-113	Increases of six sorties daily at the range and associated MTRs; slight increase in nighttime use of these routes; noticeable increase in noise levels	No change to residential use is anticipated.

*The dB levels provided here are conservatively overstated. Noise calculations are based on charted minimum altitudes along MTRs and do not account for overflight restrictions of structures by 500 feet in rural areas or 1,000 feet in urban areas. Noise levels for MTRs generally reflect centerline levels where the distribution of sorties is greatest and noise level is highest. Therefore, noise levels at ranches and homesteads would be lower than indicated.

operations (including MOAs, Restricted Areas, and MTRs) were evaluated for each NTC training option. Air quality impacts would be significant if the emissions from the proposed action (1) increase ambient air pollution concentrations above any NAAQS standards, (2) contribute to an existing violation of any NAAQS, (3) interfere with or delay timely attainment of NAAQS, or (4) impair visibility within any Federally mandated PSD Class I area. Any new major project that may lead to nonconformance or contribute to a violation of the NAAQS must conduct a conformity analysis before initiating any new action. Since the affected airspace is designated as in attainment for all criteria pollutants (CO, O_3, NO_2, SO_2, PM_{10}, and Pb), neither a conformity analysis nor an analysis of existing NAAQS violations (see items 2 and 3, above) is required.

The approach to the air quality analysis was twofold. First, emission levels for the proposed action were estimated and compared with FY00 baseline emissions to qualitatively assess potential exceedances of NAAQS. The analysis included emissions from on-base operations (stationary and mobile sources), construction activities, aircraft flying operations within the Holloman aerodrome, off-base flying operations (within MOAs, Restricted Areas, and MTRs), and NTC construction on McGregor Range. Emission levels were also used to qualitatively assess potential impairment to visibility in PSD Class I areas.

Second, an air dispersion model was used to predict the change in ambient concentrations resulting from the new aircraft emission levels. The Multiple-Aircraft Instantaneous Line Source (MAILS) dispersion model (Leibsch, 1992) was used to estimate air pollutant concentrations from a reasonable practical scenario for two AQCRs (153 and 156) where the majority of the emissions from the proposed action would occur. The MAILS model is an air quality screening model that provides conservative estimates of ground-level pollutant concentrations resulting from aircraft engine emissions during flights and is intended for low-altitude flights (below 5,000 feet). Predicted concentrations from the MAILS modeling runs were compared with existing PSD Class I and NAAQS increments for regulated pollutants.

Under the preferred training option (West Otero Mesa NTC), emissions at Holloman AFB would increase due to increases in personnel and the addition of new facilities. The proposed action net change over the FY00 base conditions, are (in tons/year): 58 (CO), -67 (VOC), 0.0 (NO_x), -3.0 (SO_x) and -48 (PM). These changes in emissions would not be expected to result in significant adverse impacts to air quality. In fact, a net decrease in VOC, SO_x, and PM is projected. Construction emissions would also result from expansion of the Red Rio impact area and at the proposed NTC. These construction-related emissions would be short-term, would be controlled using appropriate mitigation measures, and therefore would not result in significant adverse impact to air quality.

Emissions from aircraft operations within and outside the Holloman aerodrome would increase. The proposed aircraft operations within the Holloman AFB

aerodrome would result in net increases over the FY00 base conditions of (in tons/year): 47 (CO), 5 (VOC), 124 (NO_x), 4 (SO_x) and 6 (PM). The aerodrome MAILS modeling results indicate that ambient ground-level concentrations of most criteria pollutants would increase by small percentages of the NAAQS and PSD Class I increments (less than 2 percent). The exception to this is NOx, which would increase by nearly 14 percent of the PSD Class I increment (and 0.3 percent of the NAAQS).

The aircraft operations impacts are expected to be insignificant and would not result in any exceedance of the AAQS leading to nonconformance with EPA's Conformity Rule or the CAA.

4.4.1 Proposed Action

4.4.1.1 Impacts Common to All Training Options

Impacts common to all training options include emissions from stationary and mobile sources at Holloman AFB and aircraft operations in the Holloman aerodrome, in addition to impacts from construction at and maintenance of the Oscura and Red Rio impact areas.

Holloman AFB. Emissions from Holloman AFB include mobile sources such as personal vehicles and facility-based utility vehicles and heavy equipment, and traditional stationary sources associated with aircraft and facility maintenance, emissions from the construction of the required infrastructure to support operations associated with beddown of the GAF Tornado aircraft, and aircraft flying operations within the Holloman aerodrome.

<u>Commuting to and from Holloman AFB.</u> Potential emissions under the proposed action due to vehicle travel by employees and tenants to Holloman AFB were calculated using the same assumptions and methods as were applied to the baseline in Section 3.4.1.1, except that the average model year of personal vehicles during FY00 is assumed to be 1995, rather than 1990. It is assumed that a total of 2,551 military personnel would live on-base during FY00; the remainder of the manpower (3,729 military and civilian personnel) would live off-base and commute to work in personal vehicles, with an average of 1.2 commuters per vehicle. This would result in a total of 3,108 daily trips and 20,199,000 commuting miles annually. Annual criteria pollutant emissions from commuting in personal vehicles to and from the base under the proposed action (in tons per year) would be 458.7 (CO), 62.8 (VOC), 37.2 (NO_x), and 1.7 (PM).

<u>On-Base Vehicles.</u> The increase in fleet vehicles at Holloman AFB would result in additional fuel combustion emissions, depending upon the type of vehicle and the annual usage. Emissions were calculated for the 56 additional vehicles shown in Table 2.1-4, using the methods described in Section 3.4.1.1. Annual use for the additional vehicles was estimated based on the data provided for the FY95 fleet by

Holloman AFB personnel (Foster, 1997). Total fleet vehicle emissions under the proposed action (in tons per year) would be 187.1 (CO), 22.8 (VOC), 220.2 (NO_x), and 21.2 (PM).

Stationary Sources. The majority of the GAF maintenance activities would be performed in Germany. Consequently, the proposed action would not be expected to result in the addition of a large number of permanent stationary sources. The addition of facilities or activities such as heating and power production, fuel storage and dispensing, surface coating, and an increase in AGE (including backup generators) and maintenance activities would be associated with the beddown of the Tornado aircraft. The new facilities would include one permitted paint booth, which would be expected to require emission controls to reduce VOCs. The painting operation would increase total surface coating emissions by approximately 10 percent over the FY00 baseline. However, these emissions could potentially be partially offset by a reduction in maintenance emissions due to the drawdown of T-38 aircraft. In any case, new addition equipment or operations resulting from the proposed action would be evaluated against federal permitting (i.e., Title V), new source review, and aerospace coating National Emission Standards for Hazardous Air Pollutants requirements prior to construction and operation of the emission source.

Construction Emissions. The proposed action includes the construction or remodeling of 16 new facilities (including buildings and a 29-acre apron lighting project) with a total of approximately 1.8 million square feet (ft^2) and an average construction period of 485 days for each project. Emission factors with units of pounds (lbs) per 1,000 ft^2 of gross floor area from the *California Environmental Quality Act (CEQA) Air Quality Handbook* (SCAQMD, 1993) were used to estimate total construction emissions. These emission factors, which include emissions from construction equipment, material hauling, and worker travel, are: 104.79 lbs/1000 ft^2 for CO; 32.79 lbs/1000 ft^2 for VOC; 481.88 lbs/1000 ft^2 for NO_x; and 34.22 lbs/1000 ft^2 for PM_{10}. Ground disturbance fugitive dust emissions plus combustion emissions from construction equipment and construction worker travel were estimated for the grading of an additional 54 acres using emission factors from the SCAQMD's *CEQA Air Quality Handbook* and *Calculation Methods for Criteria Air Pollutant Inventories* (SCAQMD, 1993; Jagielski and O'Brien, 1994). Total emissions from on-base construction and grading of 96 acres of new facilities are estimated to be (in tons): 105.7 (CO), 33.1 (VOC), 1.8 (SO_x), 33.7 (PM_{10}), and 460.0 (NO_x).

Aircraft Operations at Holloman AFB. Projected aircraft emissions were calculated using emission factors, flight profiles, power settings, and calculation methods used in Section 3.4.1.1. Table 4.4-1 shows the projected proposed action annual aircraft emissions from aerodrome operations, including LTOs and multiple patterns at Holloman AFB.

Emissions Summary for Holloman AFB. Total projected emissions from Holloman AFB under the proposed action, excluding construction and stationary sources, are

Table 4.4-1. Proposed Action FY00 Aerodrome Aircraft Emissions

Operation	Annual Events	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
LTOs	19,080	688.7	229.6	168.4	7.8	87.0
Multiple Patterns*	39,207	63.7	12.6	319.6	10.2	31.7
Total Emissions (Proposed Action)		**752.5**	**242.1**	**488.0**	**18.0**	**118.7**

LTO = Landing and takeoff
* Multiple Patterns: These operations include low approaches for F-117 aircraft and touch-and-go's for all other aircraft.

estimated to be (in tons per year): 1,398.3 (CO), 327.7 (VOC), 745.4 (NO_x), 18.0 (SO_x), and 141.6 (PM). These include personnel commuting to and from Holloman AFB, on-base fleet vehicles, and aircraft operations.

Oscura and Red Rio Target Complexes. All training options under the proposed action include installation of TOSS units (including fiber-optic cable trenches) at the existing target arrays at the Red Rio target complex. Air quality impacts during construction activities would occur from fugitive dust from ground-clearing activities, plus combustion emissions from construction equipment and construction worker travel. TOSS equipment would be tied into existing fiber-optic cable at Oscura. No earth-disturbing construction activities would be required at this location.

The new five-mile trench system at Red Rio would be an average of four feet wide, with an average laydown width of 10 feet for equipment access and temporary storage. Ground disturbance fugitive dust emissions, plus combustion emissions from construction equipment and construction worker travel were estimated using emission factors from the SCAQMD's *CEQA Air Quality Handbook* and *Calculation Methods for Criteria Air Pollution Inventories* (SCAQMD, 1993; Jagielski and O'Brien, 1994). Total construction-related emissions from the fiber-optics project would be (in tons): 1.0 (CO), 0.3 (VOC), 1.0 (NO_x), 0.1 (SO_x), and 0.3 (PM) over the entire construction period.

Based on the extent of the area of the target complexes, dispersal of PM_{10} from munitions impacts would not escape the ranges. As discussed in Section 3.13.1.2, only trace levels of live ordnance TNT residues would be present. Wind dispersal of these residues would not be a threat. Bi-monthly maintenance of the Oscura impact area, and semi-annual maintenance of the Red Rio impact area result in sporadic fugitive dust and fuel combustion emissions. Air pollution impacts associated with these emissions are expected to be temporary and insignificant. However, these maintenance activities would not change due to the proposed action.

4.4.1.2 Impacts Common to NTC Training Options

Off-Base Flying Operations. Flying operations outside the Holloman aerodrome include MOAs, Restricted Areas, and MTRs. Sortie emissions were calculated using emission factors, sortie durations, power settings, and calculation methods described in Section 3.4.1.2. Annual aircraft emissions in MOAs, Restricted Areas, and MTRs airspaces for the proposed action are shown in Tables 4.4-2, 4.4-3, and 4.4-4, respectively.

Summary of Aircraft Emissions. The airspaces potentially affected by the proposed action span a large area over 27 counties in three states. However, the potential effects on air quality would typically be confined to the air basin in which the emissions occur. Emissions were apportioned by AQCR using the methods

Table 4.4-2. Proposed Action FY00 Emissions from MOA Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Beak A	744	12.6	2.0	24.9	1.1	2.0
Beak B	732	12.5	2.0	24.5	1.1	1.9
Beak C	682	12.0	1.7	22.7	1.0	1.7
Talon	2,545	37.2	6.7	94.6	4.1	7.0
Pecos High	2,955	9.7	1.0	140.1	3.3	2.8
Pecos Low	4,219	12.5	1.3	198.9	4.5	3.6

Table 4.4-3. Proposed Action FY00 Emissions from Restricted Area Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Lava East/West	7,066	41.7	12.8	614.3	14.1	64.4
Mesa High	6,683	37.9	13.0	593.8	13.6	63.5
Mesa Low	2,238	19.4	6.4	93.6	3.6	6.2
Yonder	464	6.5	2.0	14.6	0.8	1.4
R-5103 McGregor High	408	7.0	1.5	11.5	0.7	1.1
Red Rio	6,223	9.7	1.7	139.9	3.2	11.4
R-5103 McGregor	100	0.8	0.3	2.8	0.1	0.3
Oscura	1,942	7.3	0.5	67.0	1.7	2.4
New Target Complex	3,417	19.4	3.1	84.4	3.0	5.7
Melrose	8,744	26.4	3.2	594.2	12.6	10.0

Table 4.4-4. Proposed Action FY00 Emissions From MTR Sorties

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
VR-100/125	1,265	4.8	0.4	113.3	2.3	1.7
VR-176 Short	1,603	11.6	1.0	100.5	2.7	3.0
VR-176 Long	179	1.3	0.1	11.2	0.3	0.3
IR-133	1,291	14.9	0.8	64.7	2.0	3.5
IR-134/195	1,095	12.6	0.6	54.7	1.7	2.8
IR-192/194	658	7.6	0.4	33.0	1.0	1.7
IR-113	750	3.8	0.3	62.2	1.3	1.1
IR-102 Short	202	3.0	0.2	11.3	0.4	0.7
IR-102 Long	94	1.2	0.1	5.2	0.2	0.3
IR-141 Short	594	8.4	0.6	33.0	1.2	2.0
IR-141 Long	204	2.7	0.1	11.1	0.4	0.6

described in Section 3.4. A summary of proposed action aircraft emissions by AQCR is presented in Table 4.4-5. Although proposed aircraft operations would result in large emission increases of CO and NO_x, unlike stationary sources, the majority of these aircraft emissions are released at altitudes well above ground level and would not result in significant air quality impacts or visibility impairment, as demonstrated by the MAILS modeling results presented below.

If proposed airspace modifications (U.S. Air Force, 1997a) are not implemented, total emissions would be similar to those presented above because, although the sorties may be redistributed, there would not be any significant change in the total number of sorties. As shown in Table 4.4-6, the overall impacts to various airsheds would be relatively similar to those under the proposed action.

MAILS Modeling. Air quality impacts would occur as a result of implementation of the proposed action due to low-altitude aircraft operations. The approach to analyze these impacts was to evaluate a reasonable practical scenario for AQCRs 153 and 156, the two regions where the highest level of emissions occur, and use the results to identify potential exceedances of the NAAQS and the PSD Class I increments. The MAILS dispersion model (Leibsch, 1992) was used to estimate air pollutant concentrations from sorties by Tornado and other aircraft in the areas of greatest potential activities that would be conducted under the proposed action.

AQCRs 153 and 156 were chosen for inclusion into the MAILS modeling assessment because the aircraft activities in these two AQCRs would be expected to result in the highest concentrations due to the large number of sorties (thus, higher emissions), and the altitudes at which the emissions occur (lower altitudes would potentially result in higher ground-level ambient concentrations). The emissions associated with aircraft activities at MOAs, Restricted Areas, and MTRs were apportioned between the impacted AQCRs, as shown in the MAILS data presented in Appendix I.

Based on the projected annual sorties for these airspace units, reasonable estimates for the one-hour, three-hour, eight-hour, and 24-hour sortie numbers were developed. For the AQCR 156 MAILS modeling run (since the MAILS model does not allow any sortie entries greater than 9,999 and the annual number of sorties for F-117 aircraft are projected to be greater than 9,999), the number of annual F-117 sorties were input into the model as one-tenth of the actual sorties and the model's output annual concentration results were corrected to account for the larger sortie numbers. For the remainder of the time periods (i.e., one-hour, three-hour, eight-hour, and 24-hour), reasonable estimates of the F-117 sortie numbers were used in the modeling runs without any need for adjustment. The sortie numbers and emission factors used in the modeling runs are shown in the MAILS output printouts presented in Appendix I.

To simplify the MAILS modeling, it was assumed that all sorties occur at 300 feet AGL. This is a conservative assumption, since in some instances the sorties occur at altitudes significantly greater than 300 feet AGL (i.e., the lower modeled altitude

Table 4.4-5. Proposed Action FY00 Aircraft Emission Summary by AQCR

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	9.9	0.7	93.8	2.3	2.6
155	84.9	11.1	1071.7	25.1	23.7
153	899.9	264.6	1,272.8	41.7	173.3
012	0.7	0.1	5.9	0.2	0.2
156	100.9	29.5	1,262.5	30.8	122.0
218	0.8	0.0	3.2	0.1	0.2

*AQCR 014 emissions excluded due to insignificant levels.

Table 4.4-6. Proposed Action FY00 Aircraft Emissions by AQCR (If ALCM/Talon is not Implemented)

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	9.7	0.7	92.7	2.3	2.6
155	85.9	11.2	1,073.3	25.3	23.8
153	894.9	264.3	1,255.1	41.0	172.1
012	1.4	0.1	8.9	0.2	0.3
156	105.0	29.6	1,280.7	31.3	122.9
218	0.0	0.0	0.0	0.0	0.0

*AQCR 014 emissions excluded due to insignificant levels.

would lead to potentially higher ground-level ambient concentrations, thus exaggerating the projected impact). Thus, if this analysis did not result in significant impacts, using such a conservative assumption, it can be concluded that the proposed action would not result in significant air quality impacts.

The aircraft emissions database in the MAILS model was modified by adding revised emissions data for the aircraft engines operating in military mode. For the purpose of this analysis, a mixing height of 5,000 feet was chosen. The MAILS model was used to predict one-hour, three-hour, eight-hour, 24-hour, and annual ground-level concentrations for four air pollutants: CO, PM, SO_x, and NO_x. The concentrations predicted by the MAILS model for AQCR 153 and 156 were compared to the Federal PSD Class I increments and the NAAQS, as shown in Tables 4.4-7 and 4.4-8. The modeling runs verified that air impacts of the proposed action (as demonstrated by assessing impacts for the cumulative conditions in AQCRs 153 and 156 under a reasonable practical scenario) would be insignificant. While visibility was not assessed directly, it can be reasonably concluded that visibility would not be impaired in PSD Class I areas because the concentrations shown in Tables 4.4-7 and 4.4.8 do not exceed the PSD Class I increments. Consequently, it can be concluded that air quality impacts from the proposed action for all airspace would be insignificant. Printouts of the MAILS modeling runs are provided in Appendix I.

Conformity Analysis. Any new project which may lead to nonconformance or contribute to a violation of the NAAQS requires a conformity analysis before initiating the action. As defined in the Final Rule (40 CFR Parts 6, 51, and 93), "conformity to a SIP is defined in the Act, as amended in 1990, as meaning conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards." Consequently, the Conformity Rule applies to nonattainment areas.

Fuel spills from aerial "buddy-buddy" refueling operations are considered to be minimal and would result in insignificant emissions of VOC. Minimal (if any) fuel mists would occur from aerial aircraft operations. These mists tend to evaporate very quickly and, since they occur at high altitudes, would not be expected to reach the ground.

Except for portions of Doña Ana County, New Mexico that are designated as marginal nonattainment for O_3 and moderate nonattainment for PM_{10}, and a portion of Grant County, New Mexico that does not meet the primary standard for SO_2, the counties affected by the proposed action are designated as in attainment for all criteria pollutants (CO, O_3, NO_2, SO_2, and PM_{10}). Although MTR VR-176 crosses these two counties, it was determined that this MTR would not cross over the nonattainment portions of these two counties. Therefore, all of the affected airspace is designated as in attainment for all criteria pollutants. Consequently, a conformity analysis is not necessary.

Table 4.4-7. MAILS Modeling Results for the Proposed Action (AQCR 153)

Criteria Pollutant	Averaging Period	Concentration ($\mu g/m^3$) NAAQS	PSD Class I Increments[d]	Affected Airspace	Impact as a Percentage of the PSD Class I Increment (%)	Impact as a Percentage of the NAAQS (%)
NO_2	Annual	100	2.5	0.1479	5.92	0.15
PART [a]	24-hour	150[b]	10[b]	0.0591	0.739	0.02
	Annual	50	5	0.0137	0.343	0.03
SO_2	3-hour	1300[b]	25[b]	0.1271	0.508	0.01
	24-hour	365[b]	5[b]	0.0246	0.492	0.007
	Annual	80	2	0.0060	0.299	0.007
CO	1-hour	40,000[b]	--	3.383	0.008[c]	0.008
	8-hour	10,000[b]	--	0.4225	0.004[c]	0.004

[a] The NAAQS for particulates are for PM_{10}.
[b] Not to be exceeded more than once per year.
[c] As a percentage of the NAAQS.
[d] The PSD Class I increments for particulates are for TSP.

Table 4.4-8. MAILS Modeling Results for the Proposed Action (AQCR 156)

Criteria Pollutant	Averaging Period	Concentration ($\mu g/m^3$) NAAQS	PSD Class I Increments[d]	Affected Airspace	Impact as a Percentage of the PSD Class I Increment (%)	Impact as a Percentage of the NAAQS (%)
NO_2	Annual	100	2.5	0.3464	13.86	0.346
PART[a]	24-hour Annual	150[b] 50	10[b] 5	0.140 0.0396	1.752 0.99	0.093 0.079
SO_2	3-hour 24-hour Annual	1300[b] 365[b] 80	25[b] 5[b] 2	0.148 0.0347 0.008	0.594 0.693 0.410	0.011 0.010 0.010
CO	1-hour 8-hour	40,000[b] 10,000[b]	-- --	2.9728 0.3632	0.074[c] 0.004[c]	0.074 0.004

[a] The NAAQS for particulates are for PM_{10}.
[b] Not to be exceeded more than once per year.
[c] As a percentage of the NAAQS.
[d] The PSD Class I increments for particulates are for TSP.

Munitions expended during training activities are confined to ranges which are located away from populated areas and restricted from public access. Based on this analysis, it can be concluded that the quantity of emissions resulting from implementation of the proposed action would not be expected to cause or contribute to any exceedance of the ambient air quality standards leading to nonconformance with EPA's Conformity Rule or the CAA.

4.4.1.3 Impacts Specific to the West Otero Mesa Training Option

The proposed NTC at west Otero Mesa would involve preparation and maintenance of a two by four-mile impact area for training events. While the West Otero Mesa impact area would encompass 5,120 acres, no more than 1,024 acres of this area would be disturbed by construction. The construction of a 12-mile long, 15-foot wide firebreak road covering approximately 22 acres is assumed to be within the NTC. Construction activities outside the NTC would include improvement of an access road assumed to cover approximately 80 acres. Consequently, the total area of disturbance would be approximately 1,104 acres. Air quality impacts during construction activities related to the proposed action would occur from fugitive dust due to ground-disturbing activities, combustion products from the clearing and grading equipment, and vehicle emissions from worker travel to and from the site.

Based on an emission factor of 55 pounds/day per acre/day from the *CEQA Air Quality Handbook* (SCAQMD, 1993), the potential emissions of PM_{10} resulting from ground disturbance and excavation of the 1,104 acres are estimated at 31 tons of PM_{10}. The actual emissions would be significantly less than this estimate due to the implementation of control measures in accordance with standard construction practices.

Combustion emissions from construction equipment were estimated using exhaust emission factors for land graders from the *CEQA Air Quality Handbook* (SCAQMD, 1993). The emissions were calculated based on the assumption that ground clearing and grading activities would require the use of six diesel-powered motor graders for 20 days per month, eight hours per day, over a two- to three-month period. Total combustion emissions from grading activities are estimated to be (in tons): 6.6 (CO), 2.4 (VOC), 17.4 (NO_x), 1.6 (SO_x), and 0.8 (PM_{10}). Combustion emissions impacts could be reduced by efficient use of the equipment, a phased construction schedule to reduce the number of units operating simultaneously, and the performance of regular vehicle engine maintenance programs.

Emissions from construction worker travel were calculated assuming that each of the estimated 30 workers would drive an average round-trip of 30 miles each day, 20 days per month, over a two- to three-month period. Emission factors from *Calculation Methods for Criteria Air Pollutant Emission Inventories* (Jagielski and O'Brien, 1994) were used to estimate vehicle exhaust emissions. Total exhaust emissions from worker commutes are estimated to be (in tons): 6.4 (CO), 0.9 (VOC), 0.6 (NO_x), and 0.02 (PM_{10}). These emissions would only occur for the duration of the

construction. Therefore, the construction-related impact on air quality is expected to be below the significance level.

Annual maintenance of the NTC would involve ground disturbance of target areas over a one-month period. Construction-related impacts on air quality would be short-term and temporary.

4.4.1.4 Impacts Specific to the Tularosa Basin Training Option

The Tularosa Basin NTC site differs from the West Otero Mesa site in terms of its location and extent of ground disturbance required. The proposed dimensions are two by four miles (which equals an area of 5,120 acres). Construction would involve disturbing the full 5,120 acres, which would include a wholly contained firebreak road. The Tularosa Basin location would require the improvement of an access road covering 80 acres. Consequently, the total area of disturbance would be 5,200 acres.

Emissions from ground disturbance, construction equipment, and worker travel were calculated using the same methods and emission factors as for the West Otero Mesa training option. Total emissions from grading and excavation of the entire 5,200 acres (i.e., 5,120 acres for the NTC plus 80 acres for roads) are expected to be 143 tons of PM_{10}. The actual emissions would be significantly less than this estimate due to the implementation of control measures in accordance with standard construction practices. Emissions from construction equipment are estimated to be (in tons): 33.1 (CO), 12.4 (VOC), 86.8 (NO_x), 8.3 (SO_x), and 4.1 (PM_{10}). The emissions were calculated based on the assumption that ground clearing and grading activities would require the use of 30 diesel-powered motor graders for 20 days per month, eight hours per day, over an 11-month period. Combustion emission impacts could be reduced by efficient use of the equipment, a phased construction schedule to reduce the number of units operating simultaneously, and the performance of regular engine maintenance programs. Emissions from construction worker travel were calculated assuming that each of the estimated 150 workers would drive an average round-trip of 30 miles each day, 20 days per month, over an 11-month period. Exhaust emissions from worker commutes are estimated to be (in tons): 31.7 (CO), 4.4 (VOC), 2.8 (NO_x), and 0.1 (PM_{10}). All of these emissions would occur only for the duration of the construction and grading of the NTC. Therefore, the construction-related impact on air quality is expected to be at or below the significance level.

Emissions associated with ordnance cleanup prior to construction would occur but cannot be predicted until a detailed survey has been completed. However, specific emissions from construction equipment and earth disturbances at this site would be expected to be higher than those predicted for the West Otero Mesa training option.

Annual maintenance of the NTC would involve ground disturbance of target areas over a one-month period. Construction-related impacts on air quality would be short-term and temporary.

4.4.1.5 Impacts Specific to the Existing Range Option

The absence of an NTC would preclude any construction-related impacts to air quality such as those projected for the West Otero Mesa and Tularosa Basin training options. However, the impacts at Holloman AFB would remain the same as previously described in Section 4.4.1.1.

Off-Base Flying Operations. Flying operations outside the Holloman aerodrome include MOAs, Restricted Areas, and MTRs. Sortie emissions were calculated using emission factors, sortie durations, power settings, and calculation methods described in Section 3.4.1.1. Emissions from aircraft operations within MOAs under the Existing Range training option are identical to those presented in Table 4.4-2 for the NTC training options. Annual aircraft emissions in Restricted Areas and MTRs for the Existing Range training option are shown in Tables 4.4-9 and 4.4-10, respectively.

Summary of Aircraft Emissions. The airspaces potentially affected by the Existing Range training option span a large area over 27 counties in three states. However, the potential effects on air quality would typically be confined to the air basin in which the emissions occur. Emissions were apportioned by AQCR using the methods described in Section 3.4. A summary of projected aircraft emissions under the Existing Range training option during FY00, by AQCR, is presented in Table 4.4-11.

Although proposed aircraft operations would result in large emission increases of CO and NO_x, unlike stationary sources, the majority of these aircraft emissions are released at altitudes well above ground level and would not result in significant air quality impacts or visibility impairment, as demonstrated by the MAILS modeling results presented in Section 4.4.1.2. Since there is no significant difference in the number of sorties between the Existing Range training option and the NTC training options, it can be concluded that the Existing Range training option would also not result in significant air quality impacts.

4.4.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have a minimal effect on air quality. Although the sorties may be redistributed, there would not be any significant change in the total number of sorties. As shown in Table 4.4-12, the overall impacts to various airsheds would be similar to those under the NTC training options.

4.4.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in activities at Holloman AFB, at any existing range, or within any existing airspace

Table 4.4-9. Proposed Action FY00 Emissions from Restricted Area Sorties (Existing Range Training Option)

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
Lava East/West	7,066	41.7	12.8	614.3	14.1	64.4
Mesa High	6,683	37.9	13.0	593.8	13.6	63.5
Mesa Low	2,238	19.4	6.4	93.6	3.6	6.2
Yonder	464	6.5	2.0	14.6	0.8	1.4
R-5103 McGregor High	408	7.0	1.5	11.5	0.7	1.1
Red Rio	6,752	10.9	2.1	149.5	3.5	12.5
Oscura	3,505	16.7	1.3	106.9	3.0	4.6
R-5103 McGregor	833	6.3	2.1	22.8	1.1	1.9
Melrose	10,201	34.7	3.5	631.0	13.7	11.9

Table 4.4-10. Proposed Action FY00 MTR Sortie Emissions
(Existing Range Training Option)

Airspace	Annual Sorties	Annual Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
VR-100/125	1,564	8.3	0.5	128.4	2.8	2.5
VR-176 Short	2,237	18.9	1.2	132.5	3.6	4.6
VR-176 Long	179	1.3	0.1	11.2	0.3	0.3
IR-133	1,487	17.2	0.9	74.6	2.3	4.0
IR-134/195	155	1.8	0.2	7.2	0.3	0.4
IR-192/194	101	1.2	0.2	4.9	0.2	0.3
IR-113	1,779	15.6	0.6	114.1	2.9	3.8
IR-102 Short	93	1.7	0.2	5.8	0.2	0.4
IR-102 Long	37	0.6	0.0	2.3	0.1	0.1
IR-141 Short	238	4.3	0.5	15.0	0.6	1.1
IR-141 Long	62	1.1	0.1	3.9	0.2	0.3

Table 4.4-11. Proposed Action FY00 Aircraft Emission Summary by AQCR (Existing Range Training Option)

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	13.8	0.8	110.8	2.8	3.5
155	98.5	11.5	1,131.1	26.9	26.7
153	882.6	263.8	1,192.3	39.2	168.6
012	0.8	0.1	6.6	0.2	0.2
156	106.0	30.0	1,289.6	31.6	123.9
218	0.3	0.0	1.2	0.0	0.1

*AQCR 014 emissions excluded due to insignificant levels.

Table 4.4-12. Proposed Action FY00 Aircraft Emissions Summary by AQCR under the Existing Range Training Option (If ALCM/Talon is not Implemented)

AQCR*	Annual Emissions (tons/year)				
	CO	VOC	NO_x	SO_x	PM
154	14.1	0.9	111.9	2.9	3.6
155	91.0	11.0	1,098.5	25.9	25.0
153	876.0	263.5	1,167.0	38.3	167.1
012	2.7	0.1	14.6	0.4	0.6
156	111.2	30.2	1,312.7	32.3	125.1
218	0.0	0.0	0.0	0.0	0.0

*AQCR 014 emissions excluded due to insignificant levels.

(regardless of the availability of IR-102/141 or Talon Low MOA). As a result, this alternative would have no adverse effect on air quality in any area.

4.5 BIOLOGICAL RESOURCES

Implementation of the proposed action would affect biological resources through facility construction, changes in aircraft operations in affected airspace, and delivery of ordnance against existing and proposed targets. Facility construction would result in the disturbance of 96 acres within the developed area of Holloman AFB. Most of this area has been previously disturbed and further activity would not result in significant adverse impacts to the biota. The apron project discharges to a Water of the U.S. upstream from the wetlands and would require permitting actions under Section 404 of the CWA and under the NPDES storm water construction permit program. Measures implemented to control runoff of sediments or other pollutants and minimize disturbance of the watercourse, as required by these permits, would prevent impacts. Therefore, jurisdictional wetland habitats would be protected from construction, maintenance, or use of target complexes or support facilities at Holloman AFB. Thus, no impact to jurisdictional wetlands would occur.

Construction of an NTC and roadway improvements under the preferred option (West Otero Mesa NTC) would result in the disturbance of about 1,104 acres of shortgrass and desert scrub habitat. This would likely result in the loss of individual plants of grama grass cactus, which has been downlisted from the New Mexico listed species because it is now considered common in the state. About 1,104 acres of potential but unused habitat for the aplomado falcon, black-footed ferret, swift fox (a Federally listed species), Arizona black-tailed prairie dog, Baird's sparrow, and Western burrowing owl would be lost. In addition, aircraft activity on McGregor Range would likely result in overflights of Arizona black-tailed prairie dogs, Western burrowing owls, and infrequently used hunting habitat for bald eagles and peregrine falcons.

Impacts to biological resources were evaluated using definitions based on concepts discussed by Braid (1992). Definitions are identified in Table 4.5-1. A summary of impacts to biological resources for each ROI and training option is provided in Table 4.5-2.

4.5.1 Proposed Action

4.5.1.1 Impacts Common to All Training Options

Holloman AFB. Construction activities at Holloman AFB would be expected to have no significant impact on biological resources.

<u>Vegetation.</u> Under the proposed action, 96 acres would be disturbed at Holloman AFB for construction of support facilities. The affected area is within the base

Table 4.5-1. Definitions of Impacts to Biological Resources

General Biological Resources			
Negligible	**Low**	**Moderate**	**High**
Impact is unlikely to degrade habitat or affect individuals or populations because it is infrequent, does not occur in same time or space as resource, or effect to resource is temporary or minimal.	Impact may degrade small areas of habitat or immeasurably degrade large habitat areas. On occasion, may result in temporary changes in habitat use by a small percentage of animal population. Local animal population declines would be unlikely. Direct animal mortality would be limited to a few individuals.	Impact would measurably degrade small areas of habitat or immeasurably degrade large habitat areas. Would result in temporary changes in habitat use by a high percentage of animal population. Local animal population decline may result from: (1) permanent habitat abandonment by some individuals, (2) reduced reproductive success or life span, or (3) higher mortality.	Impact would measurably degrade small and large areas of habitat. Would result in temporary changes in habitat use. Local and regional population declines may result from: (1) permanent habitat abandonment by many individuals, (2) reduced reproductive success or life span, or (3) higher mortality.
Federal Threatened, Endangered, Proposed, and Candidate Species			
Negligible	**Low**	**Moderate**	**High**
Species not present; habitat not present; limited potential habitat or marginal quality habitat present. Equivalent to Endangered Species Act Section 7 (No Effect).	Species rarely present/ transient/located on edge of location where activities would occur. Therefore, take would not occur, habitat would not be physically modified, and human use would be relatively limited. Large areas of potential but unoccupied habitat overflown. Equivalent to Endangered Species Act Section 7 (May affect, unlikely to adversely affect).	Species present and habitat is important to life history (e.g., nesting, wintering). Large acres of habitat could be physically modified or overflights occur over large portions of occupied range or habitat. Equivalent to Endangered Species Act Section 7 (May affect, likely to adversely affect; No Jeopardy).	Substantial number of species present and habitat present. Activities would result in take of high number of animals. Large percent of critical habitat would be physically modified or have high number of overflights. Equivalent to Endangered Species Act Section 7 (May affect, likely to adversely affect; potential Jeopardy).

Table 4.5-2. Summary of Impacts to Biological Resources

Region of Influence	Biotic Component	Proposed Action: Common to all Training Options	Proposed Action: Common to NTC Training Options	Proposed Action: West Otero Mesa Training Option	Proposed Action: Tularosa Basin Training Option	Proposed Action: Existing Range Training Option	No-Action Alternative
Holloman AFB	Vegetation	96 acres disturbed with limited vegetation. However, 15 acres of relatively undisturbed vegetation would be lost. Moderate impact.	N/A	N/A	N/A	N/A	No additional vegetation disturbance.
	Wildlife	96 acres disturbed. Poor habitat. 15 acres of saltbush/sacaton habitat would be lost. Moderate impact.	N/A	N/A	N/A	N/A	No impact
	Protected and Sensitive Species	About 15 acres of Texas horned lizard habitat impacted. Western burrowing owl nest sites would be disturbed. 1 bat roost would be lost. May affect, unlikely to adversely affect.	N/A	N/A	N/A	N/A	May affect, unlikely to adversely impact.
	Wetlands	Additional stormwater discharge would pass through Waters of the U.S. and jurisdictional wetlands. No wetland loss. Negligible impact.	N/A	N/A	N/A	N/A	No effect
Existing Ranges	Vegetation	Negligible effect from disturbance of less than 10 acres for fiber-optic cable along existing road or from disturbance of less than 10 sq ft for TOSS components.	Impact to vegetation from ordnance use and maintenance would be low to moderate from additional 3.4 acres disturbed and because of low probability of fire due to fire management and no new area impacted.	N/A	N/A	Impact to vegetation from ordnance use and maintenance would remain low because of low probability of fire due to fire management and no new area impacted.	Impact to vegetation from ordnance use and maintenance would remain low because of low probability of fire due to fire management and no new area impacted.
	Wildlife	Negligible effect from disturbance of less than 10 acres for fiber-optic cable along existing road or from disturbance of less than 10 sq ft for TOSS components.	Low impact to to wildlife from continued flare, chaff, and inert ordnance use on Red Rio, Oscura, existing McGregor Target, and Melrose Range. Moderate impact on wildlife existing in Red Rio impact area from increase live ordnance.	N/A	N/A	Low impact to wildlife from continued overflight, ordnance use, and flare use on Red Rio, Oscura, and Melrose Range.	Negligible to low impact to wildlife from continued chaff, flare, inert ordnance, and live ordnance use on existing areas.
	Protected and Sensitive Species	No effect from disturbance of less than 10 acres for fiber-optic cable along existing road or from disturbance of less than 10 sq ft for TOSS components.	No effect. No species and limited habitat present in existing impact areas.	N/A	N/A	No effect. No species present and limited habitat in existing impact areas.	No effect. No species present in impact areas.

Table 4.5-2. Summary of Impacts to Biological Resources

Region of Influence	Biotic Component	Proposed Action: Common to all Training Options	Proposed Action: Common to NTC Training Options	Proposed Action: West Otero Mesa Training Option	Proposed Action: Tularosa Basin Training Option	Proposed Action: Existing Range Training Option	No-Action Alternative
	Wetlands	No effect from disturbance of less than 10 acres for fiber-optic cable along existing road or from disturbance of less than 10 sq ft for TOSS components.	No effect to wetlands. May affect Waters of U.S. if determined to be present.	N/A	N/A	No effect to wetlands. May affect Waters of the U.S. if determined to be present.	No effect. No wetlands or Waters of U.S. in impact areas.
McGregor Range	Vegetation	N/A	N/A	Permanent loss of about 1,104 acres of vegetation. Impact would be moderate to high.	Temporary loss of 5,120 acres of vegetation. Permanent loss of about 1,104 acres of vegetation. Impact would be moderate to high.	No effect	No effect
	Wildlife	N/A	N/A	Disturbance to wildlife low to moderate from 12 sorties/day, use of ordnance on NTC. Loss of about 1,104 acres of habitat would be moderate to high impact to wildlife.	Disturbance to wildlife low to moderate from 12 sorties/day and use of ordnance. Loss of about 1,104 acres of habitat would be moderate to high impact to wildlife. Re-establishment of vegetation may be needed on all but about 1,104 acres.	1.4 sorties/day over existing McGregor Target. Impacts to wildlife low to negligible.	2 sorties/day over existing target.
	Protected and Sensitive Species	N/A	N/A	Construction and use of NTC would result in loss of potential aplomado falcon habitat and grama grass cactus habitat. Unlikely to adversely affect species.	Construction and use of NTC and overflights unlikely to adversely affect species except for potential loss of night-blooming cereus.	1.4 sorties/day and use of existing target unlikely to adversely affect species.	2 sorties/day and use of existing target unlikely to adversely affect species.
	Wetlands	N/A	N/A	Potential loss of 46,000 linear feet of Waters of the U.S. No loss of jurisdictional wetlands.	Potential loss of 33,240 linear feet of Waters of the U.S. No loss of jurisdictional wetlands.	No effect	No effect
Existing Airspace	Vegetation	N/A	No effect	N/A	N/A	No effect	No effect
	Wildlife	N/A	Low effect to wildlife from 2-7 sorties/day on each MTR.	N/A	N/A	Low effect to wildlife from 1 to 4 sorties on each MTR.	Low effect to wildlife from 1 to 4 sorties on each MTR.
	Protected and Sensitive Species	N/A	Known nest sites, winter concentration/roost sites would be avoided. Noise from overflights may adversely affect.	N/A	N/A	Known nest sites, winter concentration/roost sites would be avoided. Noise from overflights may adversely affect.	Known nest sites, winter concentration/roost sites would be avoided. Noise from overflights may adversely affect.
	Wetlands	N/A	No effect	N/A	N/A	No effect	No effect

cantonment area, and has been extensively developed. Vegetation in this area is primarily limited to landscape species; however about 15 acres of the 96 to be disturbed is relatively undisturbed, four-wing saltbush/alkali sacaton vegetation. Therefore, impacts to vegetation at Holloman AFB would not be expected following implementation of the proposed action.

Wildlife. Construction activities at Holloman AFB would have no direct impact on general wildlife resources. On-base construction would be entirely located within the developed area of the base, which does not provide significant wildlife habitat. However, the apron project and the munitions storage area may have potential impacts on individual burrowing owls. Demolition projects may also impact individual bat roosts. Individual plants of grama grass cactus, downlisted from the New Mexico listed species because it is now common in the state, would likely be lost. Mitigations for these protected species are discussed below. In the absence of other significant habitat, impacts on wildlife resources would be expected to be nonexistent or negligible.

Protected and Sensitive Species. Protected resources surrounding Holloman AFB would not be adversely affected by construction or operation of the support facilities, since the facilities would be contiguous to existing facilities and primarily located on previously developed and disturbed lands. With the exception of Western burrowing owl nests, one bat roost, and Texas horned lizard habitat, no other sensitive or protected species would be in the immediate vicinity of the areas to be disturbed or used under the proposed action.

Most of the protected and sensitive species that may or do occur on Holloman AFB are migrants, associated with wetland areas that would not be affected by this project, or associated with other habitats not affected by this project. The White Sands pupfish (state protected) is found north and several miles upstream of the cantonment. Construction and operational activities would not alter the habitat or be in proximity of the species or its habitat. White-faced ibis (state protected) are regularly observed during spring and fall migrations near wetland habitat on Holloman AFB. Interior least tern (Federal endangered) are rare summer visitors to the wetland habitat on Holloman AFB. Peregrine falcons (Federal endangered) are regularly observed on Holloman AFB in the spring through fall. No nest habitat is present in the area where activities would occur and foraging areas (wetland and riparian habitat) would not be affected by the action. Similarly, bald eagles (Federal threatened) have occasionally been observed on the base in the winter, but do not roost on the base.

None of the wetland habitat on Holloman AFB would be affected by the proposed action. All activities close to wetlands would be within the current cantonment. Water quality and quantity feeding the wetland habitat would not be altered. The Baird's sparrow (state protected) is a fall and probably spring migrant that uses grasslands. Similarly, the mountain plover (Federal candidate), which uses grasslands, has been observed infrequently on Holloman AFB in the summer. The

habitat to be affected by the construction and operations is highly modified vegetation with sparse grasses and virtually no vegetation within the cantonment. Animals in the area would continue to be exposed to noise associated with aircraft operations. As detailed in Appendix J, animals exhibit a wide range of responses to noise, most of which are temporary. Animals present on Holloman AFB generally would be habituated to noise and would be distant from the noise sources. Therefore, activities would not affect these species. USFWS species of concern, such as the Western snowy plover and black tern, are associated with wetland habitat that would not be affected by construction or operational activities of the proposed action.

Spotted bat and small-footed myotis are two USFWS species of concern that occur on Holloman AFB. Building demolition could adversely affect sensitive bat species that have historically used a roost (during the spring and summer) in one of the buildings (Bldg. 291) being considered for demolition. Human use of the building has diminished since 1990. Use of this roost site by bats has been declining since 1990. Only two bats (species unknown) were observed during a 1997 survey. The reduced use by bats is thought to be partially related to the regional drought conditions. Building demolition would be timed for a period when the roost is not in use (e.g., during the fall and winter months when the bats migrate out of the area); therefore, no direct loss of bats would occur. The loss of the roost may result in a low to moderate impact since loss of roosts is considered an important factor to general declines in bat abundances in North America. Upon return to the area in the spring, it would be expected that the bats would establish a similar roost at another location.

Burrows of burrowing owls (a species of concern and protected under the Migratory Bird Treaty Act) are located in the general vicinity of the runway near the proposed construction area and in the relatively undisturbed 15-acre area immediately adjacent to the munitions area. Holloman AFB will evaluate the location of existing burrows related to construction activities and implement appropriate mitigations as needed (e.g., constructing artificial burrows). Therefore, facility construction and use associated with the proposed action would not significantly affect these species.

The 15-acre area that would be used for a new munitions storage area is habitat for the Texas horned lizard; this habitat would be lost during construction.

Wetlands and Waters of the U.S. No jurisdictional wetlands, Waters of the U.S., or riparian habitats would be disturbed from construction, maintenance, or use of support facilities at Holloman AFB. However, additional water would run off the apron expansion and discharge into the storm water drainage system and pass through the Waters of the U.S. and jurisdictional wetlands. Holloman AFB would complete the CWA Section 404 permit process to ensure that the additional discharge would result in minimal impacts.

Oscura and Red Rio Target Complexes. All training options under the proposed action include establishment of TOSS components at the Oscura and Red Rio target complexes. The scope of construction activities for these TOSS components would be small. Installation at Oscura would be confined to existing areas and would be of short duration. TOSS installation at Red Rio would include the burial of five miles of fiber-optic cable. Installation of the proposed TOSS components would involve minimal soil disturbance, and would occupy less than 10 square feet in aggregate; any loss of vegetation or habitat from this source would be inconsequential. Construction of the fiber-optic cable would disturb less than 10 acres, and would be confined to areas adjacent to existing roadways. The cable installation would comply with Section 404 and NPDES storm water permit requirements as appropriate. Requirements would be determined when base environmental personnel and a Corps of Engineers regulatory official inspect the area. Impacts to biological resources through this source would be negligible.

4.5.1.2 Impacts Common to NTC Training Options

The following discusses impacts to biota due to implementation of either of the NTC training options. Impacts associated with construction common to all training options are discussed under Section 4.5.1.1. Impacts specific to construction, use, and maintenance of the proposed NTCs are discussed in Sections 4.5.1.3 and 4.5.1.4. Impacts associated with the Existing Range training option are discussed in Section 4.5.1.5.

Vegetation. Impacts to vegetation common to the two NTC training options would primarily arise through ordnance use. Vegetation at existing impact areas (Red Rio, Oscura, McGregor Range, and Melrose Range) would be largely unaffected by the proposed changes in inert ordnance and flare delivery. These areas have been previously disturbed and past fire history indicates that existing fire management practices are sufficient to contain most brush fires. Inert munitions use would be similar between the training options and the FY00 baseline on Red Rio, Oscura impact area, and Melrose Range. Inert munitions use on the existing target at McGregor Range would be the same if no NTC was constructed or used but use would decrease by nearly 80 percent if an NTC was constructed. Overall, impacts to vegetation from changes in the use of inert ordnance would be negligible.

Under all training options, flare use would not occur on the existing target on McGregor Range. Flare use on Melrose Range would not increase under either NTC training option, compared to the FY00 baseline. Flare use would decrease by 30 to 40 percent at Red Rio compared to the FY00 baseline. Therefore, the already low potential risk of fire from flare use would decrease further. Conversely, flare use at Oscura would increase by 50 percent. The potential for fire would be low because of the safety precautions (e.g., no use during high fire risk and no use below the prescribed release altitude) and fire suppression precautions used at Oscura.

Fire is generally thought to have a major role in maintaining grasslands and reducing the spread of shrubs in the western U.S. (Valentine, 1971). This is especially true for Great Plains grasslands, which are found on Red Rio, Oscura, and Melrose Range. Each grassland type has a typical fire regime that characterizes the frequency, seasonality, intensity, severity, extent, and effects of fire on the community (Wright and Bailey, 1982). Altering the fire regime can change the species composition of a vegetation community. Short-term impacts of fire generally include reduced plant cover, removal of litter, and increased soil erosion. However, grasslands can recover within one to several years if other factors (e.g., sufficient rainfall, limited grazing, no repeated burning) are favorable (Wright and Bailey, 1982; Martin, 1975). If other factors are unfavorable, such as a burn occurring during a drought or burns occurring in consecutive years, then grass recovery may be delayed or replaced by more fire-resistant shrubs and herbaceous plants. The impacts of fire exhibited by the plant communities at Oscura, Red Rio, and Melrose Range include reduced cover after the burns, but reversion to grass-dominated communities has occurred after several years. Therefore, the additional low fire risks would probably maintain these grass-dominated communities.

The use of live ordnance at the Red Rio LDT would increase substantially, resulting in a low to moderate impact to vegetation in the immediate vicinity of the targets. Live ordnance use at the Red Rio LDT would increase to 2,005 drops under the NTC training options from 552 drops under FY00 baseline conditions. Physical damage to vegetation is substantially greater with the use of live, rather than inert, ordnance. This is due to the greater force involved, subsequent cratering effects and soil disturbance, and the aerial dispersion and deposition of substrate material (none of these factors are significant with inert ordnance). Establishment of the LDT initially resulted in the loss of an estimated 3.4 acres of vegetation cover in the graded area surrounding the LDT ground zero (U.S. Air Force, 1994c). Cratering effects were expected to result in the loss of an additional 3.7 acres of vegetational cover during the first year of operation. Total loss of vegetational cover was projected to amount to about seven acres. These numbers, however, were considered extremely conservative, and assumed that cratering would be evenly distributed, with no overlap. The concentration of craters actually tends to increase toward the center of the LDT, and overlaps considerably based on visual inspection of the area in March 1997. Currently, residual vegetation remains in the immediate vicinity of the LDT and is grazed by pronghorn. The current live ordnance use results in microtopographic conditions that allow regrowth of vegetation within the impact area. Under either NTC training option, the nearly fourfold increase in live ordnance would reduce the amount of regrowth in the impact area and increase the size of the area that would be either devoid of vegetation or have highly reduced vegetation cover.

Using the conservative assumption that the additional losses due to the implementation of the proposed action NTC training options would be simply proportionate to the increase in ordnance use, the upper bound on vegetational losses would be about 15 acres (based on a fourfold increase in live munitions

expenditures). The losses would presumably be substantially less, because most ordnance would fall near the center of the LDT, and drop off exponentially with distance. On this basis, the total additional loss of vegetation in the area under the NTC training options would probably be less than two or three acres.

Wildlife. Implementation of either of the NTC training options could affect wildlife through changes in munitions delivery, bird-aircraft strike, changes in noise levels, and changes in frequency of overflight.

Munitions. Wildlife at existing impact areas (Red Rio, Oscura, McGregor Range, and Melrose Range) would be largely unaffected by the proposed changes in ordnance delivery, except for increased live ordnance use on Red Rio. Decreased use of the existing target on McGregor Range (reduced to about 580 munition drops from the current 6,500 munition drops) would have a slight, but positive, effect on wildlife. Given the current high levels of inert munitions use at the existing Oscura and Red Rio impact areas and Melrose Range, and the similar proposed inert ordnance use under the NTC training options, it is anticipated that the impacts to wildlife would be low. Increased use of live munitions at the Red Rio LDT would result in some loss of wildlife, from increased direct mortality and indirectly through loss of habitat and continued avoidance of the area by wildlife during training activities. These impacts would be considered moderate (see Table 4.5-1). Increased use of live ordnance would result in a larger area being disturbed and a further loss of vegetation. This vegetation loss would reduce the potential use of the area by wildlife (e.g., pronghorn antelope, small birds and small mammals) that currently feed in the impact area. In addition, the loud sound resulting from live ordnance detonations may result in temporary or permanent hearing loss of animals such as small mammals in the immediate area of the detonation. Desert iguanas and Mojave fringe-toed sand lizards were shown to experience hearing losses or decreases in hearing sensitivity after exposure to simulated off-road vehicle noise of 95 to 114 dB for about seven minutes (Brattstrom and Bondello, 1983). Recovery of hearing thresholds for the kangaroo rats took at least three weeks (Brattstrom and Bondello, 1983). Small mammals such as kangaroo rats have highly developed hearing capabilities which they depend on for predator avoidance (Webster and Webster, 1972). Therefore, damage to small mammals' hearing may increase their vulnerability to predation. Finally, the increased frequency of live ordnance dropped may limit the amount of time that pronghorn and other wildlife use the area.

The use of chaff is authorized for the Red Rio target complex and Melrose Range. The chaff dispensed from most of the aircraft using these areas is considered a pyrotechnic munition because it uses an explosive charge to disperse the chaff. Use of this type of chaff would not change under the proposed action. Chaff dispensed by Tornado aircraft is not considered a munition (nonpyrotechnic) because a mechanical shredder is used to dispense the chaff. Use of this type of chaff would increase under the proposed action. Approximately 80 pounds of nonpyrotechnic chaff would be widely dispersed on roughly half of the sorties over Red Rio and

Melrose Range. (Neither U.S. nor GAF aircraft would dispense chaff of either type at the NTC.)

No studies of chaff consumption by wildlife have been conducted (U.S. Air Force, 1997d). However, hypothesized effects of chaff on wildlife have included disruption of feeding behavior or digestion; toxicity; and inflammatory response in the respiratory system, potentially resulting in silicosis. As discussed in Section 4.13.1.1, an analysis of the materials comprising chaff indicates that they are generally nontoxic in the quantities proposed (U.S. Air Force, 1997d). The chaff does not break down into respirable particulates (PM_{10}) and the study indicated no potential for adverse effects on water or soils at quantities proposed to be used. The study concluded that there were no adverse effects on biological resources due to chaff's nontoxic composition.

Studies of livestock feeding behavior and effects of consumption by livestock supports the findings that there are no adverse effects. Cattle appear to avoid eating chaff even when mixed in feed. Calves fed chaff in dry meal would eat the chaff only when coated in molasses. Consumption of chaff by calves did not result in digestive disturbance, change in weight gains, change in blood parameters, or other clinical symptoms (Barrett and McKay, 1972).

Biological resource field surveys have been conducted at Air Force ranges where chaff has been used for many years (U.S. Air Force, 1997d). At Nellis Range, Nevada, very few clumps of chaff debris were observed. No chaff was observed in bird nests, or in excavated small mammal burrows (including wood rat nests). Similarly, at Townsend Gunnery Range, Georgia, little chaff debris was observed on the ground and none was found in small mammal burrows. These field surveys tend to substantiate that wildlife would not use chaff and that the buildup of chaff over long periods of time is unlikely because it is dispersed through natural physical processes. Therefore, there would be negligible effect to terrestrial wildlife from use of chaff.

Information was not available concerning the ability of surface or bottom-feeding waterfowl and other aquatic species to process ingested chaff. However, there are no significant water bodies supporting aquatic species or waterfowl in the target areas that would be used under the proposed action (U.S. Air Force, 1997d). Therefore, there would be no effect to waterfowl from use of chaff.

Bird-Aircraft Strike. Potential impacts to wildlife from use of airspace under the NTC training options include the potential for bird and aircraft collisions (bird-aircraft strike). The U.S. Air Force maintains records on the frequency of bird-aircraft strikes, and has adopted effective measures to minimize this occurrence. These measures include seasonal and daily scheduling of sorties to avoid periods of high bird-aircraft strike hazard. Historical bird-aircraft strike data (from BASH) for existing MTRs indicate that bird/bat-aircraft collisions are extremely rare. Only 5 bird-aircraft strikes were reported on IR-134 (near Carlsbad Caverns) during a 10-year period. Even species such as Mexican free-tailed bats, that roost in large

concentrations at Carlsbad Caverns and Jornado Caves, would disperse and forage in a manner that would preclude large concentrations being hit. Bats generally would make direct flights to foraging areas and then forage low to the ground (where insects are abundant). Therefore, transiting bats may be at altitudes greater than 100 feet AGL and may be hit by aircraft. However, the potential for collision between aircraft and large numbers of bats would be remote.

As discussed in Chapter 3.0 (Table 3.13-1), the total number of bird-aircraft strikes that occurred over the past 11 years in airspace that would be used was 77 (averaging less than eight per year). While these methods minimize bird-aircraft strike as much as possible, the risk of bird and bat loss through this mechanism would increase under the proposed action.

Overflight and Noise. Aircraft overflight can affect wildlife through the combination of physical overflight and increased noise. During an overflight event, wildlife may respond with "startle effects" to the sudden appearance of an aircraft, coupled with a rapid increase in sound levels (see Appendix J). When discussing the response of wildlife to an individual noise event associated with the passage of an individual aircraft, certain noise metrics such as SEL (see Section 4.2, Noise) can be useful. It has been found, for example, that startle responses begin to appear at noise exposures greater than 95 dBA (Eleventh Air Force, 1992). SEL values are considered the most appropriate noise metric for evaluating the effects of individual noise events on wildlife. SEL values are specific to aircraft type and flying altitude. The proposed action, however, involves many aircraft types, flying at different altitudes. In this context, it is difficult to use SELs to directly assess impacts to wildlife due to changes in airspace. The following analysis assumes that as a first approximation, such impacts, as mediated by startle response, are related to changes in the frequency of overflight, expressed as "sorties per day". In general, increasing the number of overflights per day would be expected to increase the probability of a response by wildlife. Any increase in response, however, would be conditioned by existing frequency of overflight. For example, in areas with high baseline airspace use (such as Melrose Range with over 30 sorties per day) the occurrence of five or six additional sorties per day would be unlikely to result in a significant change in response by wildlife. In areas that currently have low airspace use levels, the addition of one or two sorties per day might be of more concern. In general, this analysis considers the addition of less than one sortie per day to be of negligible concern for wildlife.

In general, the proposed changes in aircraft operations in MTRs, MOAs, and Restricted Areas would result in negligible or low adverse impacts to exposed wildlife. Impacts to wildlife from overflights on or near the NTC would be low to moderate. These conclusions are reached because:

- use of most airspace under the NTC training options would be generally similar to use under the FY00 baseline (with few exceptions as noted) resulting in no net change in exposures to noise events;

- the probability of any specific animal, nests, or other wildlife receptor being overflown more than once a day would be low (the distribution of sorties would be over a large area); and

- wildlife responses to low-level jet aircraft are generally short-term and do not result in measurable changes in population numbers or habitat use by populations (see Appendix J).

Of the airspaces that would receive increased use under the proposed action compared to the FY00 baseline, Talon Low MOA, VR-176, IR-134/195, IR-102/141, and IR-192/194 encompass important biological resources. Big game habitat (e.g., pronghorn, mule deer, and bighorn sheep) and raptor nesting habitat is present throughout the region underlying portions of these airspaces. Examples are the Guadalupe Rim and National Forest lands under Talon Low MOA, IR-134/195, and IR-102/141 and National Forest lands west of the Rio Grande under VR-176. Waterfowl and shorebird migratory and winter habitat, including Brantley Lake, is present along the Pecos River beneath IR-192/194 and VR-100/125 and along the Rio Grande River under VR-176. The Jornado Caves near the Fra Cristobal Mountains under VR-176 are used by bats. Surrounding areas are used for forage by the bats. In addition, portions of the Pecos River area under IR-192/194 and other areas surrounding Carlsbad Caverns are foraging habitat for bats using Carlsbad Caverns as a summer and maternity roost.

Under the NTC training options, aircraft use of most affected airspace would increase by less than one sortie per day. Increases of one sortie per day or less would likely result in negligible to low impacts to wildlife populations.

Some airspace elements would receive more than one additional sortie per day under the NTC training options. These include: Talon MOA, the Lava and Mesa components of R-5107, R-5103 above McGregor Range and the NTC, VR-176 Short, IR-134/195, and IR-192/194. All of these areas (except R-5103) would receive from one to four additional sorties per day. Baseline use for the Lava component of R-5107 is relatively high. Projected use in this area is not significantly different from existing levels; it is possible that the proposed change in use would result in an increase in response by wildlife and low impact to wildlife populations. Appendix J provides additional information on potential impacts.

Use of IR-134/195 and IR-192/194 would roughly increase by a factor of four above FY00 baseline levels. Current use of these airspaces is one sortie per day or less. Under the NTC training options, there would be an increased probability that wildlife would be exposed to sound levels that may cause a startle response. The potential impacts to wildlife would be low because the probability of more than one or two overflights over a specific receptor would be low, and, based on past research, wildlife responses to aircraft noise appear to be primarily short-term. No sorties would be flown over Carlsbad Caverns National Park. Therefore, there would be no impact to roosting bats from noise.

Use of IR-102/141 would increase about 1.8 sorties per day over the FY00 baseline level (2.6 sorties per day) to 4.4 sorties per day under the NTC training options. This increased use would increase the probability of wildlife startle responses and other responses by wildlife (e.g., short-term physiological responses). The response of wildlife populations to the total of 4.4 sorties per day under the NTC training options would be low because the probability of any animal or herd being overflown more than once a day would be low, and wildlife responses to this low level of activity appear to be generally short-term (see Appendix J).

Use of Talon MOA would increase 3.7 sorties per day from 6.5 sorties per day in FY00 to about 10 under the NTC training options. The increased use would be distributed between low-level sorties in Talon Low MOA and high-altitude sorties in the Talon High MOAs. Therefore, there would be an increased probability that wildlife would be exposed to sound levels that may cause a startle response. The potential impacts to wildlife would be low because the probability of more than one or two overflights over a specific receptor would be low, and, based on past research, wildlife responses to aircraft noise appear to be primarily short-term (see Appendix J).

Use of R-5103 would result in about 11 additional sorties per day over McGregor Range. The potential impacts to wildlife from these overflights would be low to moderate; animals using McGregor Range are acclimated to aircraft overflights and other noise events because they are currently exposed to aircraft overflights (four per day) and weapons tests. During surveys in March 1997, only one occupied raptor nest (prairie falcon) was observed along 32 miles of the escarpment; ten unoccupied raptor nests were also observed. The few raptor species using the Otero Mesa escarpment to nest may have a tendency to avoid the escarpment because of the increase in overflights (see Appendix J for discussion of bird response to overflights). Similarly, other nesting birds may also avoid nesting habitat in the vicinity if startled during sensitive periods of the reproductive cycle (e.g., courtship and nest initiation).

The affected airspaces overlap with each other in some areas. For example, VR-100/125, VR-176, IR-113, and IR-133 converge in an area north of Carrizozo, New Mexico. This area receives about 15 sorties per day, and would receive about four additional sorties per day under the NTC training options. Given current use of this area, this increase is considered negligible, and would not result in a significant impact to wildlife. Similarly, IR-102/IR-141 and IR-192/194 overlap in the general vicinity of Talon MOA (over the Guadalupe Rim of Lincoln National Forest). This area receives about nine sorties per day, and would receive an additional seven sorties per day under the proposed action, roughly doubling overflight. For these airspaces, there would be an increased probability that wildlife would be exposed to sound levels that may cause a startle response. The affected area is relatively wide, and the probability of more than two overflights over a specific receptor would be low. In addition, based on past research, wildlife responses to aircraft noise appear to be primarily short-term (see Appendix J). As a result, the potential impacts to wildlife would be low.

Under the NTC training options, less than one sortie per night would be flown on all MTRs. Between two and four night sorties would be flown daily in the Lava and Mesa MOAs, the airspace overlying the proposed NTC, Red Rio target complex, and Melrose Range. With the exception of the NTC, these use levels would be similar to FY00 baseline levels. Therefore, impacts to wildlife would be negligible. The two night sorties over either proposed NTC would likely result in low impact to wildlife from startle effects.

If IR-102/141 and Talon Low MOA are not available, the Talon Low MOA sorties would be redistributed to the Pecos Low, Lava, Mesa Low, and Yonder airspace. This would increase use of the affected airspace, including MTRs used to access these areas, above that otherwise expected. The effect, however, would be broadly distributed over the airspace in question, and no area would receive more than a few additional sorties per day. On the whole, sortie levels and impacts to wildlife would be similar to those previously addressed.

Protected and Sensitive Species. The primary sources of impact to these species would be through bird-aircraft strike or startle effect. The largest potential effects would be through the continued use of VR-176, VR-100/125, IR-192/194, IR-113, IR-133, IR-102/141, IR-134/195, and Talon MOA. Impacts to and responses of protected species would be similar to those described for the wildlife in general.

At the time that this Final EIS was drafted, Section 7 consultation under the Endangered Species Act was not completed. The potential effects to Federally threatened and endangered species identified in this EIS are based on Air Force evaluation and input from the USFWS during meetings and discussions related to the Section 7 consultation. Section 7 consultation with USFWS is continuing. Flight restrictions identified in this EIS will meet the requirements that are identified by the Air Force and USFWS as reflected in the consultation under the Endangered Species Act.

Use of existing airspace may adversely affect peregrine falcon, Mexican spotted owl, and Southwestern willow flycatcher. Use of existing airspace may affect, but would be unlikely to adversely affect, aplomado falcon, bald eagle, whooping crane, interior least terns, swift fox, Mexican wolf, and jaguar. There would be no effect on the piping plover or black-footed ferret. Existing operational restrictions would be continued and additional restrictions would be implemented as identified through Section 7 consultation to minimize negative impacts.

Use of VR-176 Short would result in about seven daily sorties under the NTC training options. Use of VR-176 Long would result in about three sorties each week and no night sorties. Species and habitat that may be present under VR-176 include aplomado falcon, peregrine falcon, Mexican spotted owl, bald eagle, Southwestern willow flycatcher, interior least tern, piping plover, whooping crane, black-footed ferret, Mexican wolf, and jaguar.

About 1.6 million acres of semidesert grassland habitat under VR-176 is within the historic range of the aplomado falcon. There have been eight confirmed sightings of transient individual birds in the past seven years within the ROI. With the exception of some areas (e.g., some BLM lands, WSMR, and McGregor Range), few areas within the airspace have been consistently surveyed for this species. Even on these consistently surveyed areas, birds either have been observed infrequently (four times on or near WSMR) or not observed at all (McGregor Range.) This suggests that even if larger areas were surveyed, it may not result in more frequent observation of the species. Because this species has been rarely seen, and because of the low use of the MTRs, the probability of interaction between aircraft overflights and aplomado falcons is low for any specific sortie. However, the size of the habitat overflown and the total number of sorties flown over multiple years suggests that transient birds may be overflown.

There have been no studies on the responses of aplomado falcons to aircraft overflights but there have been studies on the closely related peregrine and prairie falcons and other raptors (see Appendix J). These studies suggest that falcons will nest within areas overflown by low-level jet aircraft. When these birds flush from their nests, they typically soon return and nest success is not affected. Peregrine falcons and other raptor species are known to nest in the immediate vicinity of airports under the flight patterns where aircraft land and take-off. Inferential information regarding aplomado falcon responses to human activity and noise from ground-based activity suggests that the effect on nesting and habitat use may be negligible. In Mexico, populations nested in close proximity to agricultural activities and ground-based human activities. Studies of raptors such as bald eagles, Mexican spotted owl, peregrine falcon, and Swainson's hawk suggest that raptors respond more consistently and noticeably to ground-based human activities (pedestrians, hunters, loggers, climbers) than to aircraft. Therefore, it is unlikely that the aplomado falcon would be adversely affected.

Peregrine falcon habitat and known nest sites are abundant under VR-176. All known nest sites would be avoided during the falcons' breeding season. Not all peregrine falcon habitat has been surveyed and other nest sites may be present beneath the airspace. If other nests are present, aircraft may fly close enough to these unknown nest sites to increase the likelihood of flushing nesting birds. Flushing may result in eggs being kicked from nests. Flushing may also temporarily expose eggs or nestlings so that they would be more vulnerable to predation. Therefore, this species may be adversely affected.

Mexican spotted owl habitat and known nest sites are abundant under VR-176. All known nest sites would be avoided during the breeding season. Not all Mexican spotted owl habitat has been surveyed and other nest areas may be present beneath the airspace. If other nests are present, aircraft may fly close enough to these unknown nest areas to increase the likelihood of flushing nesting birds. Flushing may result in eggs being kicked from nests. Flushing may also temporarily expose eggs or nestlings so that they would be more vulnerable to predation. Therefore, this

species may be adversely affected. The potential for adverse affect may be lower compared to peregrine falcons since Mexican spotted owls seem to have a higher tolerance for aircraft overflights (see Appendix J).

Two bald eagle nests occur under VR-176. One nest is under VR-176 Long; the second nest is under VR-176 Short. To ensure that nesting is not disrupted, both nest sites would be avoided during nesting season. Also, concentrations of wintering bald eagles occur under VR-176 (Rio Grande, New Mexico and Luna Lake, Arizona). These roosts and concentration areas would be avoided in the winter to minimize disturbance. Therefore, use of this airspace would not likely adversely affect bald eagles because of the few nests and roosts beneath the airspace and seasonal avoidance of these nests and roosts.

VR-176 is the only airspace in the ROI overlying habitat for the Southwestern willow flycatcher. Critical habitat, nest sites, and territories are located under VR-176. Use of those portions of VR-176 Long with critical habitat and known territories and nests would be avoided during the breeding season. In addition, portions of the Rio Grande with Southwestern willow flycatcher habitat would also be avoided during the breeding season.

No studies on the effects of aircraft overflights have been conducted on the Southwestern willow flycatcher. The few studies of noise effects on upland birds and poultry provide some indices of potential responses. At Naval Air Station Fallon, Nevada, chukar exhibited brief (average 57 seconds) changes in behavior in response to aircraft disturbances (Lamp, 1987). Shotten (1982) found that bird populations did not abandon areas in response to aircraft overflights. At Saylor Creek Range, Idaho, sage grouse (*Centrocercus urophasianus*) continue to use leks (breeding display grounds) in areas where low-level military jets overfly. VR-176 has been flown routinely since its inception in the 1970s. The existence beneath this MTR of the largest concentration of Southwestern willow flycatcher territories in New Mexico demonstrates that the species tolerates limited aircraft use. Under the proposed action, 0.7 sorties would be flown each day on VR-176 Long (an increase of 0.2 sorties over FY95 use levels). Without flight restrictions, operations would likely adversely affect the species. With the addition of seasonal flight restrictions, it is unlikely that the proposed use levels would affect habitat use or breeding success of Southwestern willow flycatcher.

Transient least terns may be present along the Rio Grande (historic nesting habitat) under VR-176. In New Mexico, the species historically was never common and was primarily associated with the Pecos River where remnant populations still exist. The species no longer nests along the Rio Grande but has been rarely observed migrating through the Bosque del Apache NWR, Las Cruces, and Eddy County. Because this species is a rare transient along the Rio Grande, the probability of interaction between aircraft overflights and least terns would be unlikely. For mission-related reasons, aircraft avoid these areas by 2,000 feet AGL year-round.

Therefore, overflights at these locations would not affect birds if they are using these habitats.

The piping plover is a very rare migrant in New Mexico. Piping plovers would most likely be observed along the Rio Grande (VR-176 Short) and Pecos River. The species is not known to occur along the Rio Grande, but has been rarely observed on McGregor Range during migration season. Since this species is a rare transient along the Rio Grande, the probability of interaction between aircraft overflights and piping plovers would be unlikely. Therefore, it is unlikely that the species would be disturbed by the proposed aircraft overflights.

Whooping cranes are present only under VR-176 Short. Only three birds from an experimental population remain and winter on the Rio Grande at Bosque del Apache NWR. Airspace use restrictions would be observed during the winter when the species is present. Therefore, it is unlikely that these birds would be affected by aircraft overflights.

Potential black-footed ferret habitat (grasslands) is present under portions of VR-176 Short and other airspace. However, the species is not present and the closest known experimental populations are located in Arizona outside the ROI of this proposed action. Therefore, this species would not be affected by overflights.

The Mexican gray wolf release pens (located under VR-176 Long) would be avoided when they are occupied. The limited gradual exposure of these wolves to fixed-wing military aircraft (one sortie per day) would assist in habituating the wolves to overflights. Therefore, overflights of wolves would be rare and response by wolves would likely be short-term and minor.

Potential jaguar habitat is present under VR-176 Long. No studies have been conducted on jaguar response to aircraft overflights. However, the species is nocturnal and sorties would occur during the day over potential habitat. Therefore, it is unlikely that jaguars , if present in the area, would respond to overflights. Similarly, it is unlikely that jaguars would limit their nighttime use of areas overflown during the day.

Under the NTC training options, use of VR-100/125 would increase 0.2 sorties per day to a total of 5.1 sorties per day. Bald eagle winter concentrations and roosts are present at and near Santa Rosa Lake and Sumner Lake underlying VR-100/125. These roosts and winter concentration areas would be avoided in the winter to minimize disturbance. Least terns may transit the grassland areas under this VR-100/125 since a nesting colony is at Bitter Lake NWR immediately south of this MTR. Swift fox and black-footed ferret habitat is present, but the westernmost distribution of swift fox is well east of VR-100/125 and the closest ferret population is in Arizona. Therefore, use of VR-100/125 would not adversely affect these protected species.

About seven sorties per day would occur on portions of VR-100/125 that overlap with IR-113 over the White Oak Mountains and Capitan Mountains where Mexican spotted owl and peregrine falcon nests are located. Also, a bald eagle roost area in the Capitan Mountains would be within the ground track of VR-100/125 and IR-133 where nine sorties per day would be flown. (No Mexican spotted owl habitat or nests are known to be present under IR-133.) Bald eagle winter roosts in the Capitan Mountains, under VR-100/125 and IR-133, would be avoided in the winter. All known peregrine falcon and Mexican spotted owl nest sites under VR-100/125, IR-113, and IR-133 would be avoided during breeding season. Therefore, use of these MTRs would not likely adversely affect these species.

One Mexican spotted owl nest site and protected activity center (PAC) are within the ground track of IR-194 and IR-134 (but not within the ground track of IR-192 and IR-195) in the Sacramento Mountain area of Lincoln National Forest. Five PACs have been identified on the southeast portion of the Guadalupe Rim on the ground track of IR-134/195. No owl habitat, PACs, or nests within Guadalupe Mountains National Park are overflown. Under the NTC training options, the single site would be on a ground track that would be overflown about 6.5 times a day (an increase from the 1.7 times a day under the FY00 baseline). Because of other sensitive noise receptors, the area where the Mexican spotted owl PAC is located is currently not overflown, and there would be no overflights under the NTC training options because of avoidance of other noise-sensitive receptors. The five PACs in the southeast portion of IR-134/195 are in an area that would be overflown about four times a day and once every week. However, during nesting season, the U.S. Air Force has existing avoidance requirements so that the nests are not overflown. This avoidance would be maintained under this action.

Three known areas of peregrine falcon nest habitat (with five nest sites) are located in the extreme southwest portion of Lincoln National Forest under the edge of IR-134/195 in the southeast portion of the route. In addition, suitable (but marginal) nest habitat has been identified along a canyon on the Guadalupe Rim area (Torrez, 1997). However, no nests are known to exist on the Guadalupe Rim at this site (Galleano-Popp, 1997). The suitable (but marginal) nest habitat on the Guadalupe Rim is also under IR-134/195, IR-102/141, and the Talon Low MOA. Currently, the U.S. Air Force has existing avoidance requirements so that the peregrine falcon nests are not overflown during nesting season. This avoidance would be maintained under this action.

There are no known bald eagle roost sites under IR-134/195, but one winter concentration area (Brantley Lake) is located under IR-192/194. IR-192/194 would be flown about 2.5 times a day. However, the U.S. Air Force has current avoidance requirements for the lake; therefore, the lake and birds would not be directly overflown. No bald eagle winter roosts are located on McGregor Range; the closest known is on USFS land north of McGregor Range (Tafanelli et. al, 1996). However, a few bald eagles do overfly and use isolated trees as temporary perch sites on McGregor Range.

IR-102/141 would not overlie known nests of protected species. Virtually all of the IR-102/141 and portions of IR-192/194 ground tracks are within the historic range of the aplomado falcon. Much of this area is over habitat that is suitable for this species; however, large portions of the route (e.g., Guadalupe Rim and intersection with the Talon MOA) are not over suitable habitat. Of the eight sightings of this species in the 1990s, two (in 1991 and 1996) are in the immediate vicinity of the ground track (within five miles of Van Horn, Texas and Valentine, Texas) and the remaining six are to the west of the route in New Mexico. The short route ground track would be overflown about four times a day and one night every week; the long route ground track would be overflown one time a day and one night every month. The few sightings of the species, including areas consistently surveyed (e.g., McGregor Range), and the low use of the MTRs suggests that the probability of interaction between aircraft overflights and aplomado falcons is extremely low.

Use of other airspace would be similar to FY00 baseline conditions and would therefore have a similar impact level. In addition, these other airspace units, which include MOAs and restricted airspace, either do not have low-level overflights (e.g., Beak A, B, C MOAs, Pecos High MOA, Mesa High MOA, McGregor High) or do not have protected species (e.g., Pecos Low MOA, Mesa Low MOA, Yonder, Lava).

Wetlands and Waters of the U.S. Continued use of the Oscura and Red Rio impact areas would not affect jurisdictional wetlands but could potentially affect Waters of the U.S. if determined to be present.

4.5.1.3 Impacts Specific to the West Otero Mesa Training Option

Vegetation. Construction of the NTC (including targets, roads, firebreaks, and fences) would result in the disturbance of approximately 1,104 acres. Construction would not occur on the existing ACEC black grama grasslands in close proximity to the proposed NTC site. However, improvements to roadways providing access to the NTC would result in additional disturbance to vegetation. A substantial portion of the disturbed area encompasses highly erodible soils, and vegetation loss would occur.

Grassland vegetation in New Mexico has been reduced over the last 150 years and replaced primarily by Chihuahuan Desert Scrub and Great Basin Desert Scrub (Dick-Peddie, 1993). These changes can be attributed to human activities including grazing, farming, and changes in fire frequency. These human activities have also led to establishment of non-native species (e.g., Russian thistle) and expansion or increased frequency of native species (e.g., cholla, mesquite, creosotebush).

The proposed construction and use of the NTCs would likely result in changes in vegetation composition and reduced cover. Following completion of the proposed construction, vegetational regrowth would be expected in some areas denuded by construction. Dick-Peddie (1993) suggested that the mechanism that allows invasion of brush into grasslands included loss of grassland through disturbance, reduced

rainfall infiltration with increased runoff, and catchment of runoff into small areas. The areas with less infiltration become microhabitat sites where shrubs such as rabbit brush and snakeweed can establish, and the catchment areas become microhabitat sites where junipers can establish. Shrub species and non-native species, including Russian thistle, may become more common on the disturbed areas. The general area on Otero Mesa that includes the NTC was identified as "one of the most significant high-quality areas on Fort Bliss," and represents one of the largest occurrences of Chihuahuan Desert grasslands in the U.S. (U.S. Army, 1997). The report further characterizes the general area as not appearing to have been extensively stocked and with low incidence of shrub and weedy species and a general absence of exposed, compacted, or eroded soils. However, a 1996 field vegetation survey of the NTC site found that the site continues to be heavily grazed (the BLM management target is about 50 percent annual biomass removal), and that shrubs and other invasive species are abundant and appear to be increasing (based on the age structure of the shrubs). In addition, the Otero Mesa site has signs of past plowing and blading (probably occurring in the 1930s), has shrapnel present and associated ground disturbance, and two or three fires have occurred on the site in the past 18 months. Therefore, invasive species likely will increase in this area in which the vegetation community already reflects some disturbance.

During operation of the NTC, delivery of inert ordnance would adversely affect remaining or regrown vegetation in the area (e.g., occasional impacts or small incidental fires from ordnance). These effects would be centered around the individual targets of the site, and would diminish with distance from the target centers. Periodic site maintenance activities would keep the area immediately around each target free of vegetation. It is expected that vegetational cover in the area would eventually stabilize, with an estimated net loss of approximately 10 to 20 percent (512 to 1,024 acres) of the existing vegetation cover.

The use of munitions and ground maintenance activities may result in vegetation disturbance and localized brush fires. Some of the inert ordnance that would be used at the NTC contain spotting charges to assist in scoring delivery accuracy. Spotting charges contain less than two grams of flammable material used to generate smoke. The flammable material is wholly contained within the ordnance until it is ignited to generate smoke. The targets and the immediate surrounding areas are highly disturbed. As a result, few munitions would impact in areas with sufficient flammable vegetation to pose a significant fire risk. The likelihood of fire resulting from the use of inert ordnance and spotting charges would be negligible.

In addition, the munitions to be released include nearly 9,900 flares annually. The use of flares can result in brush fires. Operational restrictions on the use of these munitions are designed to ensure that they fully combust before reaching the ground. The probability of fires being initiated by flares would be low.

While the likelihood of fires being initiated by the use of inert ordnance and flares is individually negligible, over time it is likely that use of the NTC would increase the

frequency of fires in the area, resulting in periodic vegetational losses. In most cases, such fires would be contained within the proposed firebreak road. Fire management procedures would be established with Fort Bliss. It is expected that any loss of vegetation from this source would be contained within the firebreak and general vegetation recovery would occur over two to three years.

Fire is generally thought to have a major role in maintaining grasslands and reducing the spread of shrubs in the western U.S. (Valentine, 1971). However, fire may not play as a large a maintenance role on desert grasslands compared to Great Plains grasslands. Cornelius (1988) suggested that fire was not an important factor in the maintenance of black grama desert grasslands and could be a factor in reducing grass composition and increasing shrub composition in this vegetation type. Buffington and Herbel (1965) reported that fire frequency in southern New Mexico was historically very low, supporting the hypothesis that fire may not be a major factor in maintaining desert grasslands in New Mexico. Conversely, Martin (1975) found that grass production on desert grasslands would generally return to pre-burn levels in two or three years. Vogel et al. (1996) studied the effects of fire on vegetation in creosotebush, tarbush, and bush muhly plant communities in the Tularosa Basin on McGregor Range immediately after and one year after a burn. They found that shrub cover was immediately reduced from 23 to 13 percent and remained reduced one year after the burn. Grass cover was reduced from about 36 percent to six percent immediately after the burn but increased to about 10 percent one year after the burn. Forb canopy coverage increased substantially from pre-burn conditions one year after the burn.

The impacts of fire on McGregor Range may be positive or negative, depending on the specific conditions at the time of the burn. The grasslands on the West Otero Mesa NTC are dominated by blue grama. This species is fire-tolerant but can be damaged by fire under certain conditions (e.g., drought, heavy grazing immediately after a burn). It generally recovers within one to four years after a burn. Black grama is a relative small component of the grasslands on the NTC and is less fire-tolerant than blue grama. Cable (1967; 1972) reported that black grama has a poorer response to fire than desert shrubs. However, other studies in Texas, New Mexico, and Arizona suggest that black grama can recover within two to three years after a burn. Shrub species like perennial broomweed and creosotebush would be reduced by fire while rabbitbrush would be unaffected. If the vegetation community has time to recover between burns, and the burns do not occur during droughts and grazing is controlled, then the blue grama-dominated grassland vegetation should recover. However, if areas are burned during drought, burned on consecutive years, or grazing is not controlled, then grasses may be reduced and shrubs and herbaceous plants may dominate the area. The Air Force's ability to minimize the size and frequency of fires (as demonstrated by the limited number and size of fires at Red Rio, Oscura, and Melrose Range), and the ability to coordinate between Fort Bliss and BLM to coordinate grazing, would result in the grasslands on the West Otero Mesa NTC being maintained.

Wildlife. Construction of the NTC would result in temporary or permanent displacement of wildlife currently using the area. Since the NTC impact area would be fenced, domestic livestock would be permanently excluded, while wildlife including large species (e.g., mule deer, pronghorn antelope) would continue to have access to the area. Upgrade construction of roads outside the NTC would affect about 80 acres of wildlife habitat in addition to the habitat lost within the NTC from construction and use. The road upgrade would not result in additional fragmentation of habitat. In general, the affected area, both for the NTC and for road construction, is not considered unique; therefore, the loss of habitat would not result in a reduction in biodiversity in the general area. One potential beneficial impact of the development of the West Otero Mesa NTC would be the reduced livestock grazing within the target complex. Annual vegetation growth in the undisturbed portions of the NTC would remain. Therefore, cover and food supplies for insects, nesting birds, and small mammal species may increase compared to habitat outside the NTC.

Sources of potential impacts to wildlife from use of the West Otero Mesa NTC would include aircraft noise, ordnance use, flare use, and chaff use. Using the NTC would result in daily disturbances of wildlife in adjacent areas from noise associated with ordnance use and aircraft overflights. Noise generated by aircraft overflights would increase directly over the NTC and also under the aircraft flightpath and other areas surrounding the NTC. A prairie falcon nest on the escarpment may be overflown under implementation of the West Otero Mesa training option. In addition, other raptor nests (as evidenced by the presence of 10 previously used nests along 20 miles of the escarpment) and bat roosts may be present along the escarpment and also would be overflown daily. Usage may result in limited and temporary displacement of wildlife from the perimeter of the NTC. Brush fires induced by use of the NTC would have a low impact to wildlife, since the fires would be largely confined within the firebreak road. Fires may result in direct mortality of small, relatively immobile vertebrate species (e.g., rodents, nesting birds) that might be unable to escape from burning areas. About 10,000 flares would be used over the NTC each year. The potential for fire would be low because of the safety precautions (e.g., no use during high fire risk and no use below the prescribed release altitude) and use of fire suppressant precautions (e.g., use of fire blocks). As previously discussed, no negative impacts would be expected from chaff use.

Protected and Sensitive Species. A number of protected and sensitive species are known to be present in or near the West Otero Mesa site. Potential habitat is present at this site for other such species. The following discusses potential impacts to species known to be present or that could be present at the West Otero Mesa site based on the presence of potential habitat.

<u>Grama Grass Cactus.</u> Construction and use of the proposed NTC may result in the loss of individual plants of grama grass cactus present on the West Otero Mesa site. This species has been downlisted recently from the New Mexico listed species because it is now considered common in the state (Sivinski and Lightfoot, 1995). No

plants were observed during 1997 grama grass cactus surveys of the proposed West Otero Mesa NTC site. However, potential habitat is present on about 60 percent of the 5,120-acre site. Therefore, up to 1,024 acres of habitat may be disturbed from construction and use of the site.

Aplomado Falcon. The entire 5,120-acre NTC site is within historic range of the species; therefore, potential aplomado falcon nesting habitat is present on the West Otero Mesa NTC site (Von Finger et al., 1994; Meyer, 1996). One unconfirmed sighting of an aplomado falcon was reported during May 1997 surveys on McGregor Range; however, no nests are known to be present on McGregor Range. Original evaluation of the Otero Mesa suggests that the NTC site is composed mostly of habitat that was ranked as marginal to good with about 150 acres in the NTC ranked as good to excellent (Tafanelli and Montoya, 1994). More recent evaluations of aplomado falcon habitat were conducted for Otero Mesa habitat (Meyer, 1996), comparing Otero Mesa habitat measures with occupied habitat values in Mexico. Meyer (1996) found that woody cover was higher in some locations on the Mesa and grass basal cover was lower on Otero Mesa habitat as compared to occupied habitat in Mexico. Based on the analysis, Meyer (1996) recommended that habitat classified excellent to good be reclassified as suitable; that most good to marginal areas be reclassified as suitable, and that good to marginal areas with high shrub cover (found on about 30 percent of the West Otero Mesa NTC site) be reclassified as marginal.

Construction and use of the West Otero Mesa NTC site would result in the loss of about 1,104 acres of suitable or marginal habitat located on the edge of the area of potentially suitable habitat on McGregor Range. The Otero Mesa on McGregor Range would be overflown about 11 times a day by aircraft. No confirmed observations of aplomado falcon have been made on McGregor Range. Therefore, impacts would be limited primarily to disturbance of potential suitable and marginal habitat. Because eight birds have been observed in the general region of west Texas and southern New Mexico over the past seven years, there may be a possibility that birds could re-establish in the area. However, the quality of the habitat suggests that this possibility is low at this time. Therefore, the Air Force has determined that use of the NTC and overflights on McGregor Range would not be likely to adversely affect this species.

Remaining potential but unoccupied aplomado falcon habitat within the NTC may be improved because the 5,120-acre NTC would be fenced and exclude livestock grazing. Vegetation structure and diversity on the areas not impacted by targets, ordnance, maintenance, or cleanup activities may improve as livestock grazing pressure is eliminated. Therefore, species composition and vegetation structure may become more similar to that in occupied habitats in Mexico.

Bald Eagle. Wintering bald eagles are occasionally observed on McGregor Range, mainly near the Sacramento Mountains. However, no known roost sites are present at either NTC location, and no known concentrations are present on McGregor

Range (Tafanelli and Meyer, 1995; Tafanelli et al., 1996). Therefore overflights on McGregor Range and ordnance expended at the proposed NTC may affect but would be unlikely to adversely affect bald eagles.

Baird's Sparrow. Based on general surveys of the sites and a 1977 Baird's sparrow survey, limited habitat for the Baird's sparrow is present at both NTC locations (limited to small swales). It is assumed that there is a potential that migratory and wintering birds may travel through the area. Therefore, little potential habitat would be lost from construction and use of either NTC site. This impact would be low.

Gray Vireo, Southwestern Willow Flycatcher, Mexican Spotted Owl, Piping Plover, and Peregrine Falcon. Nesting habitat is not available on McGregor Range for the gray vireo, Southwestern willow flycatcher, Mexican spotted owl, or piping plover, based on previous surveys and evaluation of habitat, including surveys of the NTC and McGregor Range in 1996 and 1997. In addition, feeding habitat is marginal for the Southwestern willow flycatcher and piping plover, and not available for the Mexican spotted owl. The Otero Mesa escarpment provides marginal but suitable habitat for peregrine falcon nests. A prairie falcon nest was observed during surveys of the escarpment in 1997. However, no peregrine falcon nests have been observed during any surveys of McGregor Range. In addition, the habitat is arid and no large water bodies are present that may serve as foraging habitat. Thus, it is unlikely that peregrine falcons would nest on the range. Therefore, impacts to these species would be negligible to low (may affect, but unlikely to adversely affect).

Arizona Black-Tailed Prairie Dog, Black-Footed Ferret, Swift Fox, and Burrowing Owl. Limited potential habitat for the Arizona black-tailed prairie dog, swift fox, and burrowing owl may be present in the proposed West Otero Mesa NTC area. Soils associated with existing prairie dog colonies on McGregor Range are not abundant on the west portion of Otero Mesa. None of these species were observed during surveys of the West Otero Mesa NTC site in 1996 or 1997. Therefore, it is unlikely that individual animals or populations would be affected by the use of the NTC. Small prairie dog populations are present to the north and west of the proposed site (Demarais et al., 1996). Burrowing owl and kit fox have been observed on the Otero Mesa (Demarais et al., 1996; Mathews et al., 1996). No swift foxes have been reported using McGregor Range. Burrowing owl burrows and prairie dog towns on McGregor Range are usually in close proximity to each other. Construction and use, therefore, may result in a loss of some potential habitat for these Federal species of concern. Impacts from overflights of these species would be expected to be low. Burrowing owl and prairie dogs have been observed in close proximity to human activities, including airports. Similarly, the endangered San Joaquin kit fox (a species closely related to the swift fox) is known to coexist with noise from oil exploration and development activities (e.g., seismic blast tests, drilling, pumping, and refining [California Energy Commission, 1996; O'Farrell et al., 1986]).

Black-footed ferrets have not been observed on McGregor Range and are not known to occur in proximity to the range. This species is usually associated with large prairie dog colonies. The sizes of the prairie dog colonies on McGregor Range are smaller than the minimum number thought to be needed to support black-footed ferrets. Therefore, the proposed action may affect but is unlikely to adversely affect this species.

Wetlands and Waters of the U.S. No jurisdictional wetlands would be affected by construction or use of the West Otero Mesa site. Up to 46,000 linear feet of dry streambed, potentially affected by either construction or ordnance use, would probably be identified by the Army Corps of Engineers as Waters of the U.S. Permitting actions would then be required under Section 404 of the CWA and the NPDES storm water construction permit program. The major requirements of these programs are implementation of measures to protect the watercourses. Site-specific field evaluations of road, firebreak, and target construction would be performed to avoid, where possible, the Waters of the U.S. If necessary, the CWA Section 404 permit process would be completed and activities would be performed in accordance with those permits.

4.5.1.4 Impacts Specific to the Tularosa Basin Training Option

Vegetation. Virtually all vegetation within the NTC site would be removed or heavily disturbed under the Tularosa Basin training option (5,120 acres). The disturbance would be primarily associated with the removal of existing ordnance. The ordnance removal would require up to 24 months. During that time, only portions of the site would be disturbed. Given the extensive disturbance at this site, it would be expected that revegetation would require several years. The reestablished vegetation would have a lower diversity compared to undisturbed vegetation, and there would be potential for undesirable annual plants to become more common than they are in undisturbed areas. As discussed in Section 4.5.1.3, vegetation disturbance would likely result in increased weed establishment in the immediate proximity of the disturbance. The Tularosa Basin area reflects disturbance from historic use. Therefore, while weed species may establish, they are currently part of the vegetation composition of the basin. The impact would be primarily limited to the immediate disturbed area and the immediately adjacent habitat. Once the NTC is cleaned and targets constructed, about 1,104 acres would remain subject to further disturbance through location of targets, firebreaks and roads, use of ordnance, and maintenance activities. Vegetation in the area would eventually stabilize with a net loss of approximately 10 to 20 percent of preexisting vegetational cover. As needed, reseeding the remaining area with native and desirable perennial plant species would be considered and discussed with Fort Bliss to minimize erosion and weed species establishment. The impact of the loss of this vegetation is expected to be moderate.

Wildlife. The reduction in vegetation due to soil disturbance would result in loss of existing relatively immobile animals (e.g., rodents, nesting birds, invertebrates) and

loss of habitat. More mobile animals would avoid the site until vegetation is reestablished. Displacement may increase stress to these animals and possibly result in shortened life expectancy or reduced reproductive success. Impacts to wildlife from cleanup and construction of this NTC would be greater compared to the West Otero Mesa NTC because of the loss of 5,120 acres and more consistent presence of ground activities over a longer time frame. The impacts during cleanup and construction would be moderate to high. Impacts to wildlife during use and maintenance of the NTC would be low, and impacts of overflights over the Tularosa Basin and Otero Mesa would be low to moderate as previously discussed.

Protected and Sensitive Species. In general, the potential impacts to habitat of protected and sensitive species would be less than the potential impacts to habitat on Otero Mesa. Construction and use of the proposed NTC on the Tularosa Basin site may result in loss of individual specimens of the night-blooming cereus, a State sensitive species. The probability of loss appears low; no plants were observed during 1997 site surveys. In addition, potential habitat on this site appears limited based on the soils present and the vegetation in the area. Potential (but unoccupied) habitat for the aplomado falcon, black-tailed prairie dog, burrowing owl, and Baird's sparrow is of lower quality or quantity compared to habitat on Otero Mesa, based on soil associations and plant communities. Falcon habitat is considered marginal to unsuitable based on comparative habitat evaluations completed by Meyer (1996) in the area of the Tularosa Basin NTC site. Sorties associated with use of the Tularosa Basin NTC would result in overflights of portions of Otero Mesa. Therefore, potential impacts to peregrine falcon, aplomado falcon and bald eagles would be similar as discussed for the West Otero Mesa NTC. Similarly, potential habitat for the black-footed ferret and its prey is limited and marginal. Therefore, impacts of cleanup, construction, and use of the Tularosa Basin NTC would result in negligible (unlikely to adversely affect) to low impacts to these species.

Wetlands and Waters of the U.S. No jurisdictional wetlands would be affected by construction or use of the Tularosa Basin site. Up to 33,240 linear feet of dry streambed, potentially disturbed by construction or ordnance use, would probably be determined to be Waters of the U.S. by the Army Corps of Engineers. Permitting actions would then be required under Section 404 of the CWA and the NPDES storm water construction permit program. The major requirements of these programs are implementation of measures to protect the watercourses. Site-specific field evaluations of road, firebreak, and target construction would be performed to avoid, where possible, the Waters of the U.S. If necessary, the CWA Section 404 permit process would be completed and activities would be performed in accordance with those permits.

4.5.1.5 Impacts Specific to the Existing Range Training Option

Vegetation. No additional impacts to vegetation would result from use of airspace under the Existing Range training option beyond those described in Section 4.5.1.2.

Construction requirements under this option would be identical to those discussed in Section 4.5.1.1.

Wildlife. Airspace use, and any related effect on wildlife, would be generally similar under this option to that described for the NTC training options. Sorties to MOAs and air-to-air sorties in Restricted Areas would remain the same as for NTC training options. Impacts to wildlife in these areas would be the same or slightly less than that described for the NTC training options.

Use of the airspace above the Oscura and Red Rio target complexes and Melrose Range would increase by roughly three to six sorties per day above the FY00 rates of 36 to 55 sorties per day, respectively[1]. In the case of VR-100/125 and IR-133, the sortie rates would increase by about one sortie per day above the FY00 baseline of about five sorties per day. Sortie levels for VR-176 Short would roughly double, while sortie levels for IR-113 would triple. In these cases, the probability of a sortie causing a startle response by wildlife would increase under the Existing Range training option.

Impacts to wildlife from increased use of the airspace under the Existing Range training option compared to the FY00 baseline would be low to negligible, as previously discussed for the NTC training options. With respect to the affected target complexes, these areas have been used intensively for similar activities for many years. Given the high past and current usage of these areas, the relatively slight increase in sorties projected under this training option would not result in a significant impact to wildlife.

Of the airspace that would receive increased use under the proposed action compared to the FY00 baseline, Talon Low MOA, VR-176, IR-134/195, IR-102/141, and IR-192/194 encompass important biological resources. Big game (e.g., pronghorn, mule deer, and bighorn sheep) habitat and raptor nesting habitat is present throughout the region underlying portions of these airspaces. Examples are the Guadalupe Rim area under the Talon Low MOA, IR-134/195, and IR-102/141 and National Forest lands west of the Rio Grande under VR-176 Short. In addition, waterfowl and shorebird migratory and winter habitat, including Brantley Lake, is present along the Pecos River beneath IR-192/194 and VR-100/125 and along the Rio Grande River under VR-176.

The trade-offs between the NTC and Existing Range training options are heavier use of IR-134/195 (raptor and big game habitat) and IR-192/194 (waterfowl habitat at Brantley Lake) and use of the NTC airspace under the NTC training options compared to the Existing Range training option. Under the Existing Range training option, heavier use would occur on the existing McGregor target, Melrose Range, Oscura impact area, VR-176 Short (raptor, large mammal, waterfowl habitat), IR-113

[1] The data for Oscura and Red Rio include sorties to Lava, a component of R-5107 overlying both Red Rio and Oscura target complexes.

(primarily desert scrub and grassland habitat), and IR-133 (primarily grassland and desert scrub habitat) compared to use under the NTC training options.

Protected and Sensitive Species. Impacts to protected species from flying activities under the Existing Range training option would be similar to those discussed under the NTC training options. The major difference is that there would be more sorties on IR-113 (four sorties per day increase), VR-100/125 (1.2 sorties per day increase), and VR-176 Short (2.5 sorties per day increase) compared to the NTC training options. There would be fewer sorties on IR-102/141 Short (2.7 sorties per day decrease), IR-134/195 (3.8 sorties per day decrease), and IR-192/194 (2.2 sorties per day decrease) compared to the NTC training options. Therefore, the likelihood of sorties over protected species would be accordingly higher or lower. Flight avoidances discussed for the NTC training options would also be implemented under the Existing Range training option.

Wetlands and Waters of the U.S. Continued use of the Oscura and Red Rio impact areas would not affect jurisdictional wetlands but may affect Waters of the U.S. if determined to be present. An evaluation of those areas is currently being completed.

4.5.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have a minimal effect on biological resources, and the above-stated conclusions would remain unchanged.

4.5.2 No-Action Alternative

Under the No-Action alternative, impacts to vegetation would be limited to continued disturbance of relatively small areas immediately surrounding existing targets on Oscura, Red Rio, Melrose Range, and McGregor Range. These areas have been consistently disturbed from ordnance use; therefore, impacts would not change. Impacts to wildlife would include continued avoidance of impact areas and startle effects from noise on ranges and under airspace. Sortie numbers and range and target use would not change; therefore, no changes in wildlife abundances or habitat use distributions would result from implementation of the No-Action alternative. Similarly, protected and sensitive wildlife species abundance and habitat use would not be affected. No impacts to sensitive habitats would be anticipated from implementation of this alternative.

4.6 ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES

The following sections address potential environmental impacts to archaeological, cultural, and historical resources that would result from implementation of the

proposed action and the No-Action alternative. Under the preferred training option of the proposed action (West Otero Mesa NTC), impacts to archaeological, cultural, and historical resources through construction, maintenance, and operation would be expected. In most cases, construction would occur in areas where such resources are not present. Project activity would, however, affect three areas where such resources are known to be present or may be present. At Holloman AFB, a recently discovered archaeological resource is present within the proposed expansion of the munitions storage area. The National Register eligibility of this resource is undetermined at this time. The U.S. Air Force is conducting a cultural resources survey for a proposed fiber-optic line at Red Rio. Previous investigations at Red Rio indicate that cultural resources occur in the vicinity of the affected area. However, it is likely that these resources could be avoided through project redesign (Giese, 1998; Wareing, 1998). Archaeological resources are present in areas that could be disturbed by construction or ordnance delivery at the West Otero Mesa NTC location on McGregor Range under the preferred option. There are nine archaeological sites at the West Otero Mesa NTC which are either eligible for listing on the National Register or have undetermined eligibility. In all cases, as part of the Section 106 compliance process, various measures would be implemented to avoid, reduce, or eliminate potential impacts to those resources that are determined eligible for listing on the National Register at Holloman AFB, Red Rio, or the West Otero Mesa NTC location.

4.6.1 Proposed Action

4.6.1.1 Impacts Common to All Training Options

Holloman AFB. Except for 15 acres for the munitions storage area, proposed construction on Holloman AFB would be limited to the developed portions of the base and would cause ground disturbance to approximately 96 acres. One archaeological resource has been identified in the proposed munitions storage area expansion. Its National Register eligibility has not been determined at this time. If this resource proves to be eligible for listing on the National Register, construction in the area would be designed to avoid the site or data collection would be performed as mitigation, depending on consultation with the SHPO in accordance with the NHPA. No prehistoric or historic archaeological resources have been identified within the remainder of the affected area on Holloman AFB. Due to the level of previous disturbance in the affected areas, no undiscovered resources are likely to be found.

Three buildings over 50 years old are located within the area of proposed construction on Holloman AFB (Figure 2.1-2): Building 107 (an academic classroom constructed in 1943); Building 289 (a small storage building constructed in 1943); and Building 291 (a hangar constructed in 1943). HABS/HAER documentation has been prepared for Building 289. Building 289 was initially considered potentially eligible for inclusion in the National Register, but the HABS/HAER documentation exhausted all research potential for the building (Ernst et al., 1996). Buildings 107

and 291 were found ineligible for the National Register. The New Mexico SHPO has concurred with these determinations (Tagg, 1997). Two other existing buildings would be renovated under the proposed action: the Flight Simulator Facility (Building 316, constructed in 1977) and the Headquarters and Operations Facility (Building 318, constructed in 1965). These buildings are less than 50 years old and are believed, at this time, to have no exceptional significance as Cold War facilities (Tagg, 1997). However, both buildings would be evaluated for National Register eligibility before any renovation proceeds. The remaining buildings identified in the proposed action would be new construction. Therefore, it is anticipated that there would be no impact from the proposed action on significant architectural resources at Holloman AFB.

No Native American traditional cultural properties have been identified on Holloman AFB by the Mescalero Apache. The installation lies north of the area likely to be of concern to the Tigua. Given the likelihood that neither the Tigua nor the Mescalero Apache will identify traditional cultural properties on the base, it is anticipated that construction activities on Holloman AFB associated with the proposed action would have no impact on traditional cultural properties.

Oscura and Red Rio Target Complexes and Melrose Range. The proposed action includes the installation of TOSS equipment at the Oscura impact area, and the construction of TOSS components at the Red Rio impact area. No construction is proposed for Melrose Range under the proposed action. Very few cultural resources were found during survey at Oscura; none of the identified sites have been excavated. The proposed establishment of TOSS components at Oscura would not impact any cultural resources because there would be no ground disturbance. Lands within the firebreak road at Red Rio have been surveyed for cultural resources. Cultural resources were identified there and some have been impacted by previous use of the target areas. A cultural resources survey is being conducted along the corridor for a proposed fiber-optic line at Red Rio. Preliminary observations suggest that significant cultural resources in the affected area, if any are discovered, could be avoided through project redesign.

The proposed action would include changes in the number and types of inert/subscale munitions used at the Oscura and Red Rio impact areas and at Melrose Range. In all three cases, increased use would be directed toward existing targets which have been heavily affected by past use; as a result, the increased use at these targets would not adversely affect cultural resources. The use of live munitions at the Red Rio LDT would also increase under the proposed action. In the past, live munitions have landed within a 0.6 mile radius of the LDT center. Archaeological sites within the 0.6 mile radius of the Red Rio LDT have been subject to mitigation under Section 106 of the NHPA. Since all live munitions are expected to continue to land within 0.6 mile of the LDT center, no impact to cultural resources would be expected.

4.6.1.2 Impacts Common to NTC Training Options

Under the proposed action, with or without IR-102/141 and Talon Low MOA being available, aircraft use of various airspace units (MOAs, Restricted Areas, and MTRs) would change as compared to the FY00 baseline. These changes in use would result, in some cases, in increased overflight of underlying archaeological, cultural, and historical resources. Three potential sources of impact to these resources associated with overflight are discussed in the following paragraphs.

Subsonic Noise. Noise-induced vibration from subsonic overflight is unlikely to result in significant physical damage to cultural resources. It is highly unlikely that surface artifact scatters and subsurface archaeological deposits would be adversely affected by vibrations resulting from aircraft overflight. With respect to standing structures, available data indicate that low-level, subsonic overflight by B-52 and fighter aircraft, in general, does not result in significant adverse impacts. For example, in studies of standing adobe structural remnants in Arizona, Battis (1988) found that low-level, subsonic overflight by B-52 and fighter aircraft resulted in no adverse impact to these structures. Vibratory studies at a museum building (adobe and beam construction) at White Sands National Monument indicate that the probability of vibration damage to such structures from low-level subsonic flights is very low (<0.3 percent). This probability applies even to fragile, poorly constructed wood frame buildings. The authors of the study concluded "the generally continuous induced vibrations from highway traffic and jet aircraft in the normal takeoff pattern are probably causing no detrimental structural effects to the building" (King et al., 1988). Moreover, the likelihood of damage decreases with distance from the centerline of the flightpath. Based on these data, physical damage to prehistoric and historic resources is predicted to be negligible to nonexistent as a result of the increased number of subsonic flights within the affected airspace.

Supersonic Noise. The proposed action includes the addition of approximately 24 supersonic sorties per year at altitudes above 10,000 feet MSL in the supersonic-approved airspace over WSMR. Sonic booms sometimes damage architectural resources. However, not all supersonic events cause measurable booms on the ground, with the sound pattern being elliptical and varying according to the aircraft's speed and altitude. Individual booms vary considerably, with the average boom pressure on the ground being 1.0 pound per square foot (psf). A sonic boom study undertaken at WSMR showed average overpressures of 0.673 psf during sonic boom events at that location. Overpressures of 2.0 psf have been found to produce approximately 75 broken window panes per million events.

The McDonald Ranch building is part of the Trinity Site National Historic Landmark. The adobe building, now restored, was where final assembly of the first atomic bomb was completed. The site lies under the established supersonic flight area and, under the proposed action, would be subject to approximately 24 additional supersonic sorties per year at altitudes above 10,000 feet MSL, as described above. While there is some indication that vibrations are causing minor cosmetic

damage to the building (Burton, 1998), it is unknown whether existing supersonic flights or other sources of vibrations are causing the damage. Regardless of the cause of the existing minor damage, the effect of additional sorties, averaging less than one every other week, is expected to be negligible.

Setting. Cultural resources must possess integrity to be eligible for listing on the National Register. Setting is one of the seven attributes used to evaluate the integrity of a cultural resource. Integrity of setting means that the surrounding landscape remains largely as it was during the resource's period of significance. Feeling is another of the attributes used to evaluate integrity and is conceptually tied to setting. Integrity of feeling means that the place is able to evoke a sense of the historic period of the resource. Audible or visual intrusions into the setting of the resource, such as that caused by low-flying aircraft, could adversely affect the resource when setting is an important aspect of the resource's National Register eligibility. For example, the setting of a cultural resource within a national monument may be an important component of the way in which the resource is appreciated by the public. On the other hand, the setting of other cultural resources (i.e., most prehistoric archaeological sites) may have no bearing on National Register eligibility if the resources are considered significant primarily because of their scientific importance. In this case, changes in setting would not be considered a significant impact.

Several parks, monuments, and special management areas lie underneath the airspace affected by the proposed action. These include: the Gran Quivira, Abo, and Quarai units of Salinas Pueblo Missions National Monument; Gila Cliff Dwellings National Monument; White Sands National Monument, the Trinity Site National Historic Landmark, the Launch Complex 33 National Historic Landmark, and the Eugene Rhoades gravesite (all located within WSMR); Three Rivers Petroglyph Recreation Area; Cornudas Mountain ACEC; and Alamo Mountain Petroglyph area ACEC. Based on the noise impact analysis presented in Section 4.2.1.2, changes in aircraft noise levels over most of the locations under the proposed action would be relatively minor, usually 0 to 3 dB over FY00 conditions. Only at Three Rivers Petroglyph Recreation Area and Gila Cliff Dwellings National Monument would there be an increase of L_{dnmr} by as much as 3 dB. In the case of Salinas Pueblo Missions National Monument, aircraft are specifically required to avoid the units of the monument.

Overflights may also intrude on the setting of traditional cultural properties or on Native American religious activities. For example, traditional ceremonies and rituals by Native Americans often depend on isolation, solitude, and silence. An aircraft flying nearby, even at very high altitudes, may be deemed by tribal members to be an unwelcome intrusion.

Under the proposed action, noise levels under VR-176, which overlies portions of the Acoma Pueblo, Zuni Pueblo, Laguna Pueblo, Ramah Navajo Reservation, and Alamo Navajo Reservation, would not increase significantly from FY00 conditions.

Noise levels over the Mescalero Apache Reservation would also be low and would not change. Capitan, Guadalupe, Salinas, and San Augustin peaks in southern New Mexico have been identified as sacred landmarks of the Mescalero Apache. The flight corridor of IR-134/195 passes about 10 NM from Guadalupe Peak. The outer edges of VR-100/125 overlie Capitan Peak. Both Salinas and San Augustin Peaks underlie R-5107B. In neither case would noise increase significantly under the NTC training options.

The U.S. Air Force has requested, and will continue to request, information on the effects of aircraft overflights on traditional cultural properties of concern to the Mescalero Apache, Acoma, Ramah Navajo, Alamo Navajo, Laguna, and Zuni.

4.6.1.3 Impacts Specific to the West Otero Mesa Training Option

A total of 22 archaeological resources and no architectural resources were recorded during the 1997 cultural resources inventory of the West Otero Mesa area. Of these, nine are considered to be eligible for listing on the National Register or undetermined and 13 are considered not eligible.

Adverse impacts to significant cultural resources could potentially occur as a result of the construction, use, and maintenance of the West Otero Mesa NTC. These activities could potentially disturb or destroy one or more archaeological sites, resulting in the loss of important scientific data. Such ground-disturbing activities include the construction, use, and maintenance of targets, scoring systems, access roads, construction staging areas, and firebreaks.

The West Otero Mesa training option would include the use of only inert ordnance and flares at the NTC. The ordnance that would be most often used is the BDU-33 unit. This unit causes about four square feet of damage to the ground. If 11,746 BDU-33s are delivered each year to the West Otero Mesa NTC over the course of 20 years, less than 22 acres would be disturbed, even if each BDU-33 happened to fall in a different spot within the 5,120-acre impact area. This 22-acre area would also include some of the acreage previously disturbed by the construction of targets. Observations made at other ranges that use nonexplosive ordnance (Peter, 1988) indicate that the greatest amount of damage occurs within 300 feet of a target (or about 6.5 acres). Less damage occurs between 300 and 1,000 feet from the target (i.e., in an area smaller than 75 acres). Only sporadic instances of ground disturbance were observed at these ranges more than 1,000 feet from the target. Therefore, it is unlikely that cultural resources more than 1,000 feet from a target would be impacted by ordnance. However, because the locations of individual targets have yet to be determined, the probability of impacts to specific cultural resources at the West Otero Mesa NTC can not be assessed. For the purposes of this EIS, it is assumed that each cultural resource within the impact area has a potential to be disturbed by ordnance. The probability of ordnance-related ground disturbance outside the impact area would be minimal.

There is a very low probability that accidental fires could occur from the use of inert ordnance and flares (see Section 4.13.1.1). Even if they did occur, grass fires typically do not have the temperatures or the duration needed to alter most archaeological artifacts. An experimental study by the NPS showed that common lithic materials do not undergo significant changes even when heated in a furnace (Bennett and Kunzman, 1986). While historic ranch buildings and features on McGregor Range (but outside the NTC areas) could potentially be damaged by fire, the probability of such an event being caused by inert ordnance or flares is very low. Overall, adverse impacts to cultural resources from grassland fires initiated through use of the NTC are considered unlikely.

In some locations, improved public access may lead to more frequent incidents of vandalism to cultural resources. The West Otero Mesa training option would include improvement of an access road to the NTC that might increase local access. However, this option would also include construction of a barbed wire fence around the impact area that would inhibit access. Combined with the NTC's location within a restricted military installation (McGregor Range), the slight improvement in access is unlikely to increase the potential for vandalism of cultural resources in the NTC.

The specific locations of targets and other facilities within the West Otero Mesa NTC location have not yet been determined. Therefore, up to nine National Register-eligible or undetermined cultural resources would potentially be affected by construction, use, and maintenance of the NTC on West Otero Mesa. As part of the Section 106 compliance process, various measures would be implemented to avoid, reduce, or eliminate potential impacts to those resources that are determined eligible for listing on the National Register.

Under a Memorandum of Agreement being developed by Holloman AFB, Fort Bliss, the New Mexico SHPO, and the ACHP, the Air Force would formally evaluate, according to National Register criteria and the U.S. Army's *Significance Standards for Prehistoric Archeological Sites at Fort Bliss* (Abbott et al., 1996), all archaeological sites within the selected option area having undetermined eligibility. This may require test excavations of some sites. The Air Force would also determine more precisely how each eligible site would be adversely affected by the selected training option, and would prepare a detailed mitigation plan for each National Register-eligible cultural resource adversely affected. The plan would be consistent with the *Secretary of the Interior's Standards and Guidelines for Archeological Documentation* (48 FR 44734-37) and take into account the ACHP's publication, *Treatment of Archeological Properties*. Implementation of the plan might not prevent disturbance to the resources, but would recover scientific and historical data from affected sites, which would mitigate their loss. The plan would discuss, but not be limited to, research questions, methods, procedures for dealing with unanticipated discoveries of human remains, and procedures for informing the Mescalero Apache and Tigua about the work. It is anticipated that, given the

relatively small number of eligible or undetermined sites within the West Otero Mesa NTC area, data recovery could be completed for all eligible resources before construction would begin.

While Otero Mesa has a long history of cattle ranching, a rural historic landscape has not been defined in the area, nor has the National Register eligibility of such a landscape been evaluated. The NTC location contains few historic features related to ranching, and there has been military use of the area for almost 50 years. Therefore, it is unlikely that the establishment of the West Otero Mesa NTC would significantly alter a potential rural historic landscape.

No Native American traditional cultural properties have been identified within the vicinity of the West Otero Mesa NTC. However, it is possible that one or more of the Native American archaeological sites found during the recent inventory might potentially be considered significant by Native Americans with traditional ties to the area. Holloman AFB has initiated government-to-government communication with the Mescalero Apache to learn more of their concerns about traditional cultural properties. The Mescalero Apache have recently expressed interest in the siting of the NTC. Fort Bliss cultural resource personnel report that the Tigua are concerned more with areas on Fort Bliss within Texas rather than within New Mexico. If either group notifies the U.S. Air Force that they have concerns regarding impacts to traditional cultural properties within the West Otero Mesa NTC, additional discussions will be held.

4.6.1.4 Impacts Specific to the Tularosa Basin Training Option

A total of 46 archaeological resources and no architectural resources were recorded during the 1997 cultural resources inventory of the Tularosa Basin NTC area. Of these, 21 are currently considered eligible for listing on the National Register or undetermined and 25 are considered not eligible.

Section 4.6.1.3 discusses the general types of impacts to cultural resources that could potentially be associated with construction, maintenance, and use of the NTC. Because of its previous use for live ordnance delivery, the entire Tularosa Basin NTC area would be disturbed during the EOD process that would be completed prior to construction. All ground containing cultural resources would be affected. For this reason, it is assumed that all 21 National Register-eligible or undetermined cultural resources within the Tularosa Basin NTC would be impacted during this process. Subsequent target construction, maintenance, and use would not add to these impacts, since the archaeological sites would already be greatly disturbed. Also, the potential for impacts caused by vandalism would be negligible, since all cultural resources in the NTC would be disturbed during ordnance disposal. Completion of the Section 106 process, as described in Section 4.6.1.3, prior to the initiation of EOD procedures could avoid, reduce, or mitigate impacts to cultural resources.

While the Tularosa Basin has a long history of cattle ranching, a rural historic landscape in the area has not been defined and the National Register eligibility of such a landscape has not been evaluated. The NTC location contains few historic features relating to ranching and there has been military use of the area for almost 50 years. Therefore, it is unlikely that the establishment of the Tularosa Basin NTC would significantly alter a rural historic landscape.

No Native American traditional cultural properties have been previously identified within the Tularosa Basin NTC area, although it is possible that one or more of the Native American archaeological sites found in this area could have special significance to the Mescalero Apache. The U.S. Air Force will continue to pursue government-to-government communication with the Mescalero Apache regarding their concerns.

4.6.1.5 Impacts Specific to the Existing Range Training Option

Selection of this training option would result in fewer impacts to archaeological, cultural, and historical resources than those projected for the West Otero Mesa and Tularosa Basin training options, due to the absence of the NTC and its associated ground disturbance. Noise levels over parks, monuments, special management areas, known sacred mountains, and reservations (see Section 4.6.1.2) would generally be the same or lower than FY00 baseline. Only for Gila Cliff Dwellings National Monument and the Three Rivers Petroglyph Recreation Area would there be an increase in noise levels of more than 2 dB (3 dB and 4 dB, respectively).

Oscura and Red Rio impact areas and Melrose Range would see increased use as compared to FY00 baseline under this training option. As in the West Otero Mesa training option, this increased use would be confined to currently used target areas. Potential impacts to cultural resources at Oscura, Red Rio, and Melrose Range would be similar to those identified for the West Otero Mesa and Tularosa Basin training options.

4.6.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have a minimal effect on archaeological, cultural, and historical resources, and the above-stated conclusions on the potential impacts from overflights would remain unchanged.

4.6.2 No-Action Alternative

Implementation of the No-Action alternative would result in no additional effect in activity in the area affected by the proposed action or elsewhere. In particular, no construction would be initiated, and no change in aircraft operations would be

implemented. As a result, no effect on archaeological, cultural, and historical resources would be expected.

4.7 WATER RESOURCES

Water resources, including both groundwater and surface resources, can be affected through activities such as facilities construction and the use of munitions, which result in earth disturbance, thereby changing surface water runoff and soil loss. Other processes that can affect water resources include changes in the discharge of effluents, or soil contamination. These impact sources are discussed in the following sections. Aircraft operations in airspace are not considered to be a source of impact to water resources. Impacts on water supply and demand are addressed primarily under Section 4.11, Utilities.

Overall, no significant impact to water resources would be expected to arise from implementation of the preferred training option (West Otero Mesa NTC). While implementation of the proposed action would require construction-related earth disturbance at Holloman AFB, Red Rio impact area, and at the proposed NTC on McGregor Range, this disturbance would be short-term, and temporary. Application of appropriate erosion control measures would minimize runoff and adverse impacts to surface water resources. Construction activities would not be expected to affect groundwater resources. Changes in munitions use at the existing target complexes would not be expected to result in changes in earth disturbance in these areas. As a result, no change in runoff or impact to surface water or groundwater quality would be expected. The introduction of the use of inert/subscale munitions at the proposed NTC would result in a continuing level of earth disturbance at this site. This would arise from both the use of inert/subscale munitions themselves, and from periodic maintenance activity. Erosion control measures would continue to be used to minimize impacts to surface waters.

4.7.1 Proposed Action

4.7.1.1 Impacts Common to All Training Options

Holloman AFB. Under the proposed action, approximately 96 acres would be disturbed within the developed area of Holloman AFB. This is expected to include approximately 40 acres for the proposed apron expansion. Exposure of underlying soils would lead to increases in sediment loading in downstream receiving waters. Storm water runoff within the cantonment is collected in the base storm water drainage system and ultimately delivered to Lake Holloman. The exposure of soils would be temporary, and would be dispersed over a wide portion of the base. Federal regulations require that erosion and storm water discharges from construction sites greater than five acres be controlled. For the proposed earth-disturbing construction and operational activities, SWPPPs would be modified/developed. Applicable NOIs would be submitted for coverage of

operations under the existing Multi-Sector General Permit for Storm Water Discharges from Industrial Activities. Applicable NOIs would also be made for construction projects disturbing over five acres and EPA-approved individual actions under the NPDES General Permit for Storm Water Discharges from Construction Activities. The storm water outfall construction requires Section 404 compliance with either Nationwide Permit #7 or #26 (see Section 2.5, Permit and Consultation Requirements for further discussion of permitting requirements). With employment of the permit measures, no significant impact to water resources would be expected from the proposed construction.

The proposed apron construction involves paving 40 acres of unpaved but partially disturbed or compacted soil. This, combined with the 10+ new acres of buildings, would increase surface runoff as reported in USACE (1996b). In one location where drainage is being diverted out of the existing drainage system into the new apron drainage system, drainage would increase by approximately 30 percent, but this would be partially balanced by reductions elsewhere. Additionally, the drainage ditches are bordered by jurisdictional wetlands that would help to buffer increased flows. At Forty-Niner Avenue, where all of the main flightline drainages converge, drainage is expected to increase by four percent. As a result, runoff from the base would increase slightly. This would increase the volume of water delivered to local drainages, resulting in increasing velocities, turbulence, and sediment load in these drainages.

The construction of on-base facilities, infrastructure, and improvements would comply with base-specific engineering and design standards. The Holloman AFB General Plan (U.S. Air Force, 1996) specifies that potential impacts to storm water drainage will be analyzed on an individual project basis. Therefore, each individual construction project would be analyzed prior to construction in terms of project-specific and cumulative impacts of storm water drainage and flood control. Furthermore, project-specific design controls and mitigative measures would be implemented such that no adverse impact to surface water resources would occur.

Under the proposed action, the volume of hazardous materials stored and used at Holloman AFB would increase. With respect to surface water resources, the projected increase in hazardous waste storage on the base increases the potential for release of these materials into local and regional waterways or water bodies. In accordance with RCRA requirements, Holloman AFB has developed facility-specific plans and training and exercises to secure control of hazardous materials, products, and waste. The base has also taken significant measures to comply with CWA requirements as specified in the applicable NPDES permits, SWPPPs, Spill Prevention, Control, and Countermeasures Plans, and has implemented corrective and mitigative measures detailed in these plans. Training and inspections are routinely conducted and documented. Additional spill response and reporting procedures are performed as required by the Multi-Sector General permit (Federal Register, pg. 505804-51319, 09/29/95) and the associated SWPPP. To ensure compliance with RCRA, the CWA, and related Federal environmental

requirements, similar plans would be developed for new facilities and as new personnel are incorporated into the training program. At this level of control, release of hazardous materials to local and regional waterways is unlikely, and no significant impact would be expected under implementation of the proposed action.

Oscura and Red Rio Target Complexes. All training options under the proposed action include establishment of TOSS components at the Oscura and Red Rio target complexes. Installation of TOSS components at Oscura would make use of existing equipment and fiber-optic cables. Therefore, no ground disturbance would be involved and no impact on water resources would result. Installation of the TOSS components at Red Rio would involve no excavation, and soil disturbance would be minimal. As a result, no significant impact to water resources would be expected from this source. Installation of the fiber-optic cable at Red Rio would result in temporary disturbance of less than 10 acres of soil along the cable route. It is assumed that the trench line for the cable would be dug and refilled as the cable was being laid. Thus, no more than about one acre or less would be disturbed at any given time. While construction of the cable line would result in increased erosion potential, any effects would be short-term and temporary. Use of standard construction practices, such as silt fences and screens, would be sufficient to minimize any impact on surface water resources.

Use of inert/subscale munitions would increase at the Oscura and Red Rio impact areas under all training options. This increase, compared to existing levels, would be slight and would not result in changes in earth disturbance due to impact of the inert munitions, or due to maintenance activities. As a result, no impact on surface or groundwater resources would be expected from this source.

Use of live munitions would also increase at the Red Rio LDT under all training options. The use of MK-82 units would increase from 500 units to just under 2,000 units in FY00; this increase is considered substantive. The use of live munitions would lead to increased soil disturbance. Under these conditions, soil erosion during periods of heavy precipitation could lead to increased turbidity in local surface waters. However, surface water expression in the area is modest, and during storm events the ephemeral streams of the area naturally carry a high sediment load. It would be expected that any increase in sediment load associated with increased erosion in the vicinity of the LDT would be imperceptible. However, if needed, appropriate management practices (e.g. check dams, detention ponds) would be used to minimize stream sedimentation.

Rainfall over the area has the potential to leach uncombusted explosive materials or ordnance residue from the surface or near surface. Increased use of the Red Rio LDT would be expected to increase deposition of such degradation products in the area. While this could affect surface water quality, soil contamination levels following the initial one-year operation period for the LDT were found to be quite low (less than one-half ppm) (U. S. Air Force, 1994c). These concentrations presumably reflect residual levels of TNT following degradation and leaching processes. No significant

contamination of local surface waters due to the initial operation of the LDT was noted. Given the low annual precipitation in the area, the relative insolubility of TNT, and the negligible measured soil contamination levels due to past use of live munitions, despite the fourfold increase in live munitions expenditure projected under the proposed action, no significant impact on surface water quality would be expected. WSMR has an ongoing program to monitor springs throughout the range. The U.S. Air Force would, however, continue to monitor water quality at Red Canyon Spring to detect any change due to the proposed action.

It is possible that deposition of TNT ordnance residue on the soil at the Red Rio LDT could potentially result in groundwater contamination. However, the presence of large quantities of highly soluble gypsum in the soil suggests that rainfall infiltration is negligible. In the absence of infiltration, no contamination of groundwater due to implementation of the proposed action would be expected. Ongoing monitoring of nearby Red Canyon Spring would permit the detection of any change in groundwater quality following implementation of the proposed action. Bomb detonation in the vicinity of the LDT could affect water flow to the Yeso formation (see Section 3.7.1.2, Groundwater Resources). Available data are not adequate to determine whether such changes, should they occur, would affect water flow at Red Canyon Spring. Spring flow at Red Canyon Spring will continue to be monitored (U.S. Air Force, 1994c).

4.7.1.2 Impacts Common to NTC Training Options

Implementation of either of the NTC training options would affect water resources as described for the proposed action in general, or as described specifically for each NTC site being considered. There would be no impacts common to both NTC sites, other than those described for the proposed action in general.

4.7.1.3 Impacts Specific to the West Otero Mesa Training Option

Implementation of the West Otero Mesa training option would not be expected to result in significant adverse impacts to the availability or quality of surface water on McGregor Range. Proposed construction activities on west Otero Mesa would disturb 1,024 acres at the NTC, plus an additional 80 acres for access road maintenance. While rainfall in the area is low, and all streams in the NTC area are ephemeral, some of the streambeds are potentially Waters of the U.S. If the dry streambeds are found to be Waters of the U.S. and NTC activities are found to potentially impact greater than 500 feet of these waters, an individual Section 404 permit would be required prior to construction in order to meet Waters of the U.S. compliance requirements. Where Waters of the U.S. are potentially affected, the U.S. Air Force would also comply with the NPDES permitting provisions of the CWA Act. TOSS construction would be Section 404 permitted under either a Nationwide Permit or an individual permit. The fiber-optic cable installation may fall under the pending NPDES General Permit (Section 2.5 provides further discussion of permitting requirements). No significant impact to storm water

runoff would be expected due to construction of the NTC under the West Otero Mesa training option, since activities would be conducted in accordance with permit requirements and erosion control practices.

The delivery of inert/subscale munitions and periodic maintenance of the target areas, firebreak roads, and access roads would result in continuing earth disturbance at the NTC. Past experience on existing ranges is that soil disturbance from the use of inert/subscale munitions is small, and localized around individual targets. Approximately 20 percent of the NTC site (1,024 acres) would be at least partially disturbed by munitions delivery and maintenance. However, the primary source of soil disturbance is from maintenance of firebreaks and access roads, which may result in gully formation and increase wind erosion. While surface water features in the area are ephemeral, during rainstorms these factors are likely to result in increased runoff and sediment load to the ephemeral surface water streams.

Field inspection of the proposed NTC site indicates that local washes and draws discharge to impoundments (stock tanks) on west Otero Mesa. These impoundments do not discharge to secondary or tertiary waterways or water bodies during normal rainfall/runoff events. In addition, the impoundments serve as silt traps that capture and settle the sediment load from the primary waterways. Additional sediment loads would be captured in these impoundments. Adjustments to normal maintenance schedules (including periodic scouring) may be required to maintain the effective life span of recipient impoundments. As a result, impacts to surface water resources due to implementation of the West Otero Mesa training option would be minimal and no significant impacts to water quality would be expected.

The ephemeral washes draining the proposed NTC site are not significant contributors to local surface water supply. During normal rainfall/runoff events, surface water is locally contained in shallow swales and depressions. What runoff does occur is captured in small impoundments intercepting the primary waterways. During high-volume (low probability) rainfall/runoff events, surface waters would be discharged to secondary and tertiary waterways. Passage would be accomplished by channeling water through the spillways of these small impoundments. Impoundments on the larger waterways, designed as double or triple impoundments, prevent release of excess surface water during low-probability events.

Local surface water is supplemented by water imported through the Sacramento River pipeline. This system of small (two-inch diameter) pipes originates on Carrizozo and Sacramento Creeks, up to 60 miles north of points of use on west Otero Mesa. The source of these waters is several large watersheds in the Sacramento Mountains foothills (principally Carrizozo and Wildcat Canyons). Construction and maintenance of the NTC would have little impact on imported surface waters, since project actions are not expected to disturb the delivery pipeline, pumphouses, booster stations, and/or storage tanks.

Operation of the proposed NTC site on west Otero Mesa would involve taking appropriate actions to avoid damage to several water development structures operated and maintained by BLM. These structures include a water delivery pipeline, water storage tanks, and a pumphouse. These water developments used by grazing livestock and wildlife would be within the safety area of the West Otero Mesa NTC. There are about 30 miles of water pipeline, 17 earthen impoundments, three water storage tanks, and 26 water troughs. The pipeline traverses the southwest end of the proposed NTC and predates the use of the west Otero Mesa by the U.S. Army. The water storage tanks and pumphouse are within 100 yards of the southwest corner of the proposed NTC. This water delivery system is the principal source of water for cattle and wildlife on west Otero Mesa, and is considered an integral part of the federal grazing lease. The structures currently within the NTC safety area that might be negatively impacted would be relocated if the West Otero Mesa training option is implemented. Appropriate coordination with BLM on relocating water resources would be conducted, should this training option be implemented. Access to these water developments may be limited to ensure safety during use of the NTC. Therefore, coordinated scheduling between BLM and the Air Force would be needed to ensure inspections and repairs could continue in a timely manner.

Large volumes of groundwater are not developed or used on west Otero Mesa. Several exempt wells having a capacity of less than 30 gpm for domestic or stock watering use have been identified on west Otero Mesa from well registration records and drilling logs at the New Mexico State Engineer Office. None of these small-capacity wells are located in the immediate area being considered for the NTC site. The construction and use of an NTC at this site would not be expected to require development or use of groundwater resources. In addition, the area is not considered a significant source of groundwater recharge. Therefore, selection of this training option would not be expected to have a net impact (negative or positive) on local or regional groundwater resources.

4.7.1.4 Impacts Specific to the Tularosa Basin Training Option

Implementation of the Tularosa Basin training option would not be expected to impact the availability or quality of surface water resources. Construction, maintenance, and use of the Tularosa Basin NTC site would be generally similar to that described for the West Otero Mesa site, although soil disturbance during construction would be more extensive because of the need for UXO removal. However, as with the West Otero Mesa site, rainfall in the area is low, and all streams in the NTC area are ephemeral. Permitting considerations would be similar to those for the West Otero Mesa site. Given limited surface water expression in the area, and the proposed implementation of runoff erosion control measures, no significant surface water impact would occur. The type of impacts and associated permitting/erosion control measures would be similar to those described for the West Otero Mesa site.

Operation of the proposed NTC site on the Tularosa Basin would involve taking appropriate actions to avoid water development structures. Water developments used by grazing livestock and wildlife would be within the safety area of the Tularosa Basin NTC. These developments include about six miles of water pipeline, 12 earthen impoundments, two water storage tanks, and two water troughs. Access to these water developments may be limited to ensure safety during use of the NTC. Therefore, coordinated scheduling between BLM and the Air Force would be needed to ensure inspections and repairs could continue in a timely manner.

Groundwater resources are not currently developed or used in the area where the proposed NTC would be located within the east fringe of the Tularosa Basin. The construction and use of this NTC site would not be expected to require development or use of groundwater resources. In addition, the area is not a significant source of groundwater recharge. Therefore, selection of this training option would have no net impact on local or regional groundwater resources.

4.7.1.5 Impacts Specific to the Existing Range Training Option

Impacts to water resources under this training option would be similar to those described for the proposed action in general. Expenditure of inert/subscale munitions would be somewhat higher at existing ranges (Melrose, Oscura, Red Rio, and the existing target on McGregor Range) than described for the NTC training options. The proposed increase, compared to existing levels, remains slight and would not result in changes in earth disturbance due to impact of the inert munitions, or due to maintenance activities. As a result, no impact on surface or groundwater resources would be expected from this source under the Existing Range training option.

4.7.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have no effect on water resources, and the above-stated conclusions would remain unchanged.

4.7.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in activities in any area affected by the proposed action. As a result, water resources would be unaffected. No significant impact to water resources would arise if the No-Action alternative were implemented.

4.8 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Changes in operations can result in changes in the use of hazardous materials and the generation of hazardous waste. Impacts to hazardous materials and waste management are addressed in the following sections. Solid waste generation is addressed under Section 4.11, Utilities. Overall, implementation of the preferred training option (West Otero Mesa NTC) would not result in a significant impact to the management of hazardous materials or hazardous wastes at Holloman AFB.

4.8.1 Proposed Action

4.8.1.1 Impacts Common to All Training Options

Holloman AFB. Implementation of the proposed action would result in changes in the amount of hazardous materials and wastes handled at Holloman AFB.

Hazardous Materials. Holloman AFB would continue to use hazardous materials in moderate amounts under the proposed action. No new waste streams are anticipated. No unusual composite materials or unusual hazardous materials are associated with the Tornado aircraft. Existing procedures for the centralized management of procurement, handling, storage, and issuing of hazardous materials through the HAZMART will be retained and used. Implementation of the proposed action would result in an increase in the use of hazardous materials for aircraft maintenance of approximately 20,000 pounds annually. Major maintenance and repair on additional general purpose vehicles would be performed under warranty by off-base vehicle dealers; therefore, there would be very little increase in the on-base use of hazardous materials for vehicle maintenance (Moncayo, 1996).

Hazardous Waste Management. Under the proposed action, GAF aircraft maintenance procedures would not change significantly. Major processes such as jet engine overhauls would be done in Germany. Fuel cell maintenance is not currently done at Holloman AFB, but would be required under the proposed action. GAF procedures for this process, however, do not require that the cells be entered by personnel or cleaned. The minimal hazardous waste generated by the new fuel cell facility would be of the same types currently handled at the base. GAF personnel would not perform any munitions maintenance that would generate hazardous waste (Hartell, 1997).

Hazardous waste generation from aircraft maintenance activities would increase approximately 10,000 pounds annually under the proposed action. This is approximately five percent of the calendar year 1997 (CY97) baseline (220,000 pounds per year). The FY00 baseline would be 230,000 pounds per year. The increase over the CY97 baseline is not significant. Only a small additional amount of hazardous waste would be generated by other activities such as vehicle maintenance. These wastes could be handled and disposed of using existing procedures. The current 146,000 pounds of hazardous waste storage capacity would accommodate the

increase in waste quantities. The base Hazardous Waste Management Plan would be updated to reflect any changes of hazardous waste generators and waste accumulation point monitors.

The IRP manager has determined that, under the proposed action, installation of utilities would occur near IRP Site 59. Prior to construction, the work area would be over-excavated and backfilled with clean soil. This procedure is not IRP-specific and would not be designed to clean up the entire IRP site, but would isolate the work area from the remaining contamination. Workers removing the contaminated soil would take the 40-hour OSHA training course and be certified to perform this type of work. The excavated soil would be contained and transported to an off-base, permitted disposal facility. No other IRP site would be impacted by construction activities in support of the proposed action (Neff, 1998).

Medical Wastes. Medical waste generation at the base hospital would increase by approximately 100 pounds per month under the proposed action. The increase is not significant and the waste would continue to be picked up and disposed of off-base by a private contractor (Grippo, 1996; Lopez, 1996).

Oscura and Red Rio Target Complexes. Installation of the TOSS units at Oscura and Red Rio would result in the generation of small quantities of hazardous wastes. The scope of construction, primarily associated with the installation of fiber-optic cable at Red Rio affecting less than 10 acres, is small, and the generation of construction-related hazardous waste would be negligible. Operation of the TOSS units would generate small quantities of hazardous waste (e.g., spent batteries); the amount involved is again considered negligible.

4.8.1.2 Impacts Common to NTC Training Options

Under the proposed action, the delivery of inert/subscale munitions at the Oscura and Red Rio impact areas and at McGregor and Melrose Ranges would continue. Live munitions would also continue to be expended at the Red Rio LDT within the Red Rio impact area. These areas would be cleaned periodically, following a continuation of existing procedures. The EOD would render UXO nonexplosive. Munitions scrap metal would be picked up and recycled through the DRMO at Holloman AFB. The increase in munitions waste at these locations is considered negligible, and no adverse impact on hazardous waste management would be expected.

Delivery of munitions to an NTC on either the West Otero Mesa or Tularosa Basin sites would generate approximately 150,000 additional pounds of nonhazardous scrap metal each year. This 30 percent increase would not pose an environmental threat. The increased amount can be accommodated by DRMO (Rasnick, 1996).

4.8.1.3 Impacts Specific to the West Otero Mesa Training Option

Waste management and disposal requirements for the operation of an NTC constructed on the West Otero Mesa site would be identical to those described for the NTC in general. The potential for UXO within this NTC site is slight. If UXO is determined to be present, appropriate removal and disposal actions would be required.

4.8.1.4 Impacts Specific to the Tularosa Basin Training Option

Waste management and disposal requirements for the construction and operation of an NTC at the Tularosa Basin site would be identical to those described for the NTC in general. However, the Tularosa Basin site is contaminated with debris and UXO from previous and ongoing live weapons testing on McGregor Range. In order to implement the proposed action using the Tularosa Basin training option, the impact area would have to be decontaminated. Prior to decontamination, the site would be surveyed to determine the amount of UXO present. Decontamination of the impact area would be a beneficial impact.

4.8.1.5 Impacts Specific to the Existing Range Training Option

Total munitions expenditure under this training option would be the same as described for the NTC training options. In the absence of the construction and operation of an NTC, however, some munitions expenditures would be redirected to the existing target complexes on WSMR, McGregor, and Melrose Ranges. Munitions expenditures and associated waste management requirements at these locations would therefore increase above that described for the NTC training options. Total hazardous waste management requirements would be the same as with the construction of an NTC, and would result in no significant adverse impact to hazardous waste management.

4.8.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have no effect on hazardous materials and waste management, and the above-stated conclusions would remain unchanged.

4.8.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in activities at Holloman AFB, at any existing range, or within any existing airspace. As a result, this alternative would have no adverse effect on hazardous materials use and waste management.

4.9 SOCIOECONOMICS

This section presents the results of an analysis of the socioeconomic effects resulting from implementation of the proposed action and the No-Action alternative. The details of the methodology, assumptions, and calculations are reported in Appendix G. The discussion here focuses on the relative changes estimated for Otero County, which is where most of the direct economic activity would take place. Otero County would also experience the larger relative change. The details of the relative impacts to the ROI are reported in Appendix G.

The primary measures by which socioeconomic impacts are identified include changes to employment and income, estimated number of people entering or leaving the area, and associated changes in public services. Impacts to socioeconomic conditions would be driven primarily through:

- Long-term increases in personnel requirements at Holloman AFB;
- Short-term increases in labor demand associated with facilities construction;
- Increases in secondary employment driven by both short-term and long-term changes in direct labor force; and
- Construction-related expenditures other than for labor.

These changes in personnel requirements, labor demand, and expenditures would affect various socioeconomic measures, including: employment and income, housing, and population. In turn, these changes in employment and regional population would affect the level of services required from various public organizations, including: education, police and fire protection, and hospitals and medical care. Potential impacts on low-income and minority populations, and on the possible effects of aircraft overflight on rural socioeconomics are also examined. Overall, implementation of the preferred training option (West Otero Mesa NTC) would result in slight, but beneficial, impacts on socioeconomic conditions in the three-county ROI around Holloman AFB. No significant impact to low-income and minority populations or to rural socioeconomics would be expected.

4.9.1 Proposed Action

The activities associated with the proposed action are assumed to take place from 1998, the first year of construction, through the year 2001, when all changes anticipated under the action would be completed. Direct employment would fluctuate over the five-year period, with the year 2000 expected to have the largest difference on employment from the level it would have been without the action. This investigation focuses on the expected change in employment and population in the year 2000, comparing it to what the year-2000 employment and population is expected to be without the action under the No-Action alternative. It also looks at

the year 2001, the first year without construction employment related to the action but with the total increase in GAF personnel expected to be in place.

4.9.1.1 Impacts Common to All Training Options

Holloman AFB. Table 2.1-2 shows the expected changes in personnel associated with the proposed action. This information, combined with associated estimates of construction labor requirements and expenditures, was used to calculate the total changes anticipated in local economic activity in the year 2000. The details of the assumptions associated with these estimates are discussed in Appendix G. This section summarizes the results of the analysis.

Under projected baseline conditions in the year 2000, the number of U.S. military and civilian personnel is estimated to be 5,290, and the number of GAF military and civilian personnel is estimated to be 350, for a total staffing of 5,640. Under the proposed action, it is anticipated that GAF military and civilian personnel would increase by 640, resulting in a new total GAF staffing of 990. In addition, it is estimated that another 110 construction personnel would be involved in completing construction associated with the proposed action, or 13.3 percent. In the year 2001, all construction would be completed and the direct employment increase would be limited to the 640 GAF personnel, an increase of 11.3 percent over the projected baseline employment numbers at Holloman for the year 2000.

Otero County. Local expenditures related to the proposed action, including purchases and wages, are estimated to increase by $31.0 million in Otero County in 2000, going from $176.3 million under projected baseline levels to $207.3 million with the proposed action, an increase of 17.6 percent in Holloman-related local spending. With the completion of construction, expenditure levels are estimated to decline to $194.5 million in the year 2001 in the ROI, an increase of 10.3 percent over the year 2000 projected baseline level (for details, see Appendix G, Table G.4.4-2).

In the year 2000, the increased spending associated with the proposed action would generate additional economic activity and jobs. In addition to the 750 employees directly employed due to the proposed action, another 197 secondary jobs in Otero County are estimated to be created to support the higher level of economic activity. These jobs are "secondary" in that they are not directly created by Holloman (the "primary" job category), but would develop in the second round of economic activity as the people with the primary jobs and businesses with Holloman subcontracts spend money on goods and services. The total increase in county employment is estimated to be 947 in the year 2000, representing less than 3.5 percent of total employment (in 2000, Otero County employment is forecasted to be 27,131, as shown in Table 3.9-2). The estimated increase in the number of county households is 743, or nearly five percent of the 1990 housing stock of 14,921 (Table 3.9-6). The estimated population in the year 2000 is calculated to increase by 1,814 or 3.2 percent of the 57,437 projected to be living in Otero County (Table 3.9-2). By 2001, when all construction related to the proposed action would be completed,

employment in Otero County is estimated to be 730 higher than it would have been without the action. Housing is estimated to be 640 higher, and total population is estimated to be 1,563 higher (see Appendix G, Table G.4.5-2).

Education. Under the proposed action, year 2001 school enrollments would increase by approximately 230 students (grades K-10). These students are expected to be from German families since the additional commercial jobs associated with the proposed action are assumed to be filled by unemployed workers already living in the community.

A German school is currently operating in cooperation (co-use) with one of the Alamogordo elementary schools. This school, using a German-based curriculum, is intended to meet the needs of the children of GAF personnel assigned to Holloman AFB. At the present time, the number of students at the German school is about 40. It is anticipated that the number of students will increase in the future when four classrooms will be available. The growth of 230 students would require the construction or leasing of a new building to accommodate the German school. At this time, plans to implement this German school are under consideration of the German government (GAF, 1997).

Police and Fire Protection. Alamogordo employed 73 police/fire officers in 1996, for a ratio of approximately 400 to 420 residents per officer. Assuming that Alamogordo wants to keep the same level of protection given the expected permanent population change of 1,563 after the year 2001, the city would need to hire another four officers by the year 2001. The city is already planning to hire another officer when the new fire station is completed in the next couple of years, leaving another three officers needed. This would represent a growth of officer employment of four percent, which is within normal growth expectations. Therefore, there would be no significant impact on police and fire protection services as a result of the proposed action.

Hospitals and Medical Care. GCMH is currently operating 62 beds, and the Holloman AFB medical facility is currently a seven-bed facility. The Holloman Medical Center is in the process of becoming an ambulatory surgery facility. This gives the county a ratio of approximately 800 county residents per hospital bed. In the year 2001, the population increase of 1,563 would result in a requirement of an additional two-bed capacity. Even without building a new facility, GCMH is licensed for 90 beds, indicating that certified capacity is adequate for the average demand on the facilities. With the plans in place for building a new hospital in Alamogordo, increased demand for medical care should not cause problems in the area. Therefore, there would be no significant impact to health care services or capacity. Otero County has eight dental offices and a total number of 12 dentists. Based on the 1995 county population of 54,792, this dentist pool is meeting the service needs of approximately 4,570 people per dentist. The addition of 1,563 people under the proposed action would require services from the equivalent of another dentist working one-third of a full-time schedule. The existing dentist pool should be able

to accommodate this increase in the population service needs, with each dentist's schedule increasing on average by 2.9 percent.

Public Finance. In 1996, estimated per capita revenues for Alamogordo were $1,239; estimated per capita expenses were $1,363. Assuming a growth in population of 1,563 in 2001, total revenues for the city are estimated to increase by $1.9 million, which represents an increase of 5.3 percent over 1996 revenues. Expenses are calculated to increase by $2.1 million. For Otero County, per capita revenues were $362 in 1996, with expenses at $241. With population growing by 1,563 as a result of the proposed action, total revenues are estimated to increase by $0.6 million or almost three percent of the total. Expenses are estimated to increase by $0.4 million.

Airspace. A broad area beyond Holloman AFB would experience changes in overflight due to implementation of the proposed action. These changes in overflight would not directly affect socioeconomic resources, but might affect considerations of environmental justice, as discussed below. In addition, during the public comment period for the Draft EIS, concerns were expressed that increased overflight might affect property values, or adversely affect business activity. Additional information is provided below to address these concerns.

Environmental Justice. This section analyzes whether the proposed action would have disproportionately high and adverse effects on minority or low-income populations with regard to overflight noise. MTRs and MOAs that would be used for proposed training activities (under any of the training options being considered) overlie 82 different census tracts/BNAs in 27 counties in New Mexico, Texas, and Arizona (see Section 3.9.8, Low-Income and Minority Populations, for a description of census tracts/BNAs). However, not all of these tracts are adversely affected by noise. The "Schultz curve" predicts the average response of communities to various noise levels (see Section 4.2). The most common point referred to on the updated and validated Schultz curve is 65 dB. This is a benchmark often applied to determine residential land-use compatibility around airports or highways. By extension, it can be used as one criterion in planning of airspace. The 65 dB L_{dn} level is useful to recognize as a level that, when exceeded, is normally not compatible with residential land use. Therefore, the search for disproportionately high and adverse effects on low-income and minority populations is limited to those areas where L_{dnmr} dB levels are at 65 dB or higher.

The only areas analyzed in this document at which the day-night noise level would exceed 65 dB are Holloman AFB, impact areas within the existing bombing ranges (e.g., Red Rio and Oscura impact areas on WSMR, and Melrose Range) and within the proposed NTC impact area. Other than the residential areas on Holloman AFB, none of these areas contain any dwellings. Consequently, no populations would be subjected to significant adverse effects and there would be no disproportionately high and adverse effects on minority or low-income populations.

Property Values. During the public comment period for the Draft EIS, concerns were expressed that aircraft overflights could affect land values. The question of aircraft overflights potentially affecting land values has been asked in many locations throughout the nation. In some locations, particularly around airports, documentation has been prepared that seeks to quantify the economic effect of aircraft overflight on land values. This documentation primarily deals with aircraft noise around airports in an urban setting. The variability of land value, due to diversity of location and improvements, has made it extremely difficult to quantify differences in land value associated with aircraft activity, even in the immediate vicinity of scheduled and direct overflights near airports.

In a rural setting, such as under an MTR, changes in daily aircraft overflight may or may not be readily discernible to the ground-based observer. Where such changes can be discerned, existing variability in land value due to locations and improvements make it impossible to quantify any potential difference that might be associated with aircraft overflight. In the present instance, given the rural nature of the area and the relatively sporadic nature of overflights, changes in overflight would not be expected to produce measurable impacts on the economic value of the underlying land.

Economic Activity. Comments received during the public comment period for the Draft EIS indicated concern with the potential effect of increased overflight on economic activities such as ranching, tourism, and the motion picture industry in west Texas. Presumably, such impacts on business activity would be driven by increased annoyance in the overflown population. This issue was not previously considered because it is not seen as a likely source of impact, given modest levels of change in airspace use. However, in response to the public comments received, this issue is given further consideration.

On MTRs, sorties are distributed over the route which may be 60 or more miles wide. A ground observer may not even be aware of the additional flights along the route. Overflights could be more concentrated with MOAs and, especially, Restricted Areas. As presented in Section 4.2, a total of 12 percent of the points modeled for the noise analysis showed noise changes that would be considered noticeable to ground-based observers. Points 58 and 79 showed changes in noise levels that would be considered substantial. It is possible that a recreationist could be startled or that a film crew would need to perform another "take" should an overflight occur at a specific point and at a specific moment in time, but the random distribution of people, activities, and aircraft make it impossible to predict the occurrence of such an event.

The noise analysis shows that the overall change in noise due to implementation of the proposed action would not be substantial. In most cases, ground-based observers would not be substantially disturbed by additional overflights, and often they would not be aware of an additional one or two sorties in the MTR or in the local airspace. Therefore, no significant adverse consequences to economic activities are projected.

4.9.1.2 Impacts Common to NTC Training Options

With respect to socioeconomic impacts, the three training options differ only in terms of construction activity associated with the NTC, and potential effects on grazing on existing leases on west Otero Mesa. These impacts are option-specific, and, as such, are addressed in the following sections.

4.9.1.3 Impacts Specific to the West Otero Mesa Training Option

Construction. Under the West Otero Mesa training option, target complex construction costs are estimated to be approximately $4 million; those expenditures are projected to occur in 1998 and 1999. This would temporarily increase employment and population levels in Otero County and, to a lesser extent, in El Paso and Doña Ana County (see Appendix G, Table G.4.4-1). By the year 2000, when NTC construction would have been completed, employment and population would continue at the same levels projected for the proposed action in general.

Grazing. Under the proposed action, cattle grazing would be excluded from the 5,120-acre impact area. Otero County provided the U.S. Air Force with results from its own assessment of the economic impacts to Otero County that assumed removing cattle from the 5,120-acre impact area. The County's analysis was based on detailed economic data contained in the New Mexico State University and Chaves County Input-Output models. The County's results indicate a loss of between $30,648 to $38,022 in agricultural revenues and between $9,760 to $10,029 in personal income annually, and a reduction of 0.48 to 0.53 full-time jobs. Total annual loss estimated under the assumption that no cattle would graze within the impact area amounts to between $40,408 and $48,051.

If the County's assumptions are accurate, a loss of $48,051 represents approximately 0.4 percent of the $9.8 million value of agricultural products sold in Otero County in 1992. The decline in personal income represents approximately 1.0 percent of the net cash return from agricultural sales in Otero County in 1992, and less than 0.01 percent of total personal income.

The safety area for a training range would extend beyond the 5,120-acre impact area. The proposed action would not exclude grazing from the safety area. Throughout the West, including New Mexico, grazing regularly occurs in similar U.S. Air Force training range safety areas. Based on this experience, no reduction in AUMs in grazing lands currently leased in the proposed safety area would be expected.

Otero County also prepared an analysis that assumes a substantial reduction of grazing within the safety area, specifically in grazing units 9 and 13. If grazing were to be reduced as projected by Otero County, the reduction in agricultural activity would amount to $157,280 to $195,120 annually, with a total reduction of between 2.47 and 2.74 full-time jobs.

However, grazing operations in training range safety areas throughout the West, including New Mexico, have not experienced such a reduction of grazing as assumed by Otero County. As long as access, water lines, and grazing conditions remain as proposed for the safety area surrounding the NTC, grazing operations are expected to continue up to the active range fence line. Although there may be some additional scheduling and coordination for ranching operations to access certain areas, and this would result in some disruption to operations, compatibility of existing safety areas and ranching operations demonstrates that there is no basis for assuming a substantial reduction in AUMs in the safety area. Based upon these factors, the U.S. Air Force estimates that total annual impacts to the agriculture industry in Otero County will be between $30,648 and $38,022 as projected by Otero County for the loss of the 5,120-acre impact area from grazing. Any reduction in grazing activity would have an effect upon the specific operations that use or plan to bid on an affected grazing unit; however, the loss of 0.4 percent of the value of Otero County's agricultural revenues is not considered a significant impact.

4.9.1.4 Impacts Specific to the Tularosa Basin Training Option

Construction. Under the Tularosa Basin training option, target complex construction costs are estimated to be approximately $20 million. Those expenditures are projected to occur in 1998 and 1999. The higher costs for the Tularosa Basin training option are due to greater site cleanup requirements associated with the presence of UXO. This difference would result in different employment levels in those years (see Appendix G, Table G.4.4-1). Employment and population changes are estimated to be the same under this option for the year 2000 and beyond as discussed above. Therefore, the estimated socioeconomic impacts are also the same.

Grazing. This training option does not require removing acreage from grazing allotments, and no impact on agricultural activity would result.

4.9.1.5 Impacts Specific to the Existing Range Training Option

Under this training option, the same airspace would be used as would be the case with the NTC training options. As with the NTC training options, there is no indication that low-income and minority populations would be disproportionately impacted by proposed training activities and overflights than would the general population in the affected region.

4.9.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have no effect on socioeconomic conditions, and the above-stated conclusions would remain unchanged.

4.9.2 No-Action Alternative

No change in socioeconomic conditions prevailing in the year 2000 would result from implementation of the No-Action alternative.

4.10 TRANSPORTATION

Changes in personnel level and population can affect vehicle use, resulting in potential impacts to traffic flow. Short-term impacts on traffic can result from construction activities. Such potential impacts are discussed in the following sections. Overall, implementation of the preferred training option (West Otero Mesa NTC) would not result in any significant impact on the area's transportation network.

4.10.1 Proposed Action

4.10.1.1 Impacts Common to All Training Options

Holloman AFB. The traffic analysis used the standard analysis techniques of trip generation, trip distribution, and traffic assignment. Daily trips were distributed to and from the project site based on existing travel patterns for commuters and on the location of residences of base personnel. It was assumed that the residential choices of employees, under the proposed action, would correspond to those of current base personnel. Based on the results of the trip distribution analysis, trips were assigned to the surrounding roadway network along existing travel routes to the study area.

Traffic impacts were assessed for the conditions that would prevail if the proposed action were implemented over the conditions of the projected baseline year (2000). The number of daily vehicle trips generated on the roads within the ROI would increase by 2,240. As discussed in Section 3.10, traffic volume-to-capacity ratios are used to evaluate LOS ranges. Table 4.10-1 provides the results of this analysis and shows the effects of the proposed action on baseline conditions. This comparison of the FY00 baseline and proposed action LOS assignments shows that there would be no change in the highway capacity performance for any of the roadway segments. All roadway segments would operate at LOS C or better, and would experience no significant impact as a result of traffic associated with the proposed action.

Under current range use, State Road 506 in the north area of McGregor Range is closed occasionally for safety reasons when necessitated by range operations. Range activities under the proposed action would not change the established closure practices and frequency. Access to the safety area would be precluded when the NTC was in use. If necessary, access roads within the NTC impact area would be relocated. Transportation would be unaffected elsewhere in the general vicinity of the NTC.

Table 4.10-1. Peak Hour Volumes and Level of Service for the Proposed Action and Projected Baseline (FY00)

Roadway	Segment	Capacity	Projected Baseline FY00		Proposed Action	
			PHV (vph)	LOS	PHV (vph)	LOS
U.S. 54	South of U.S. 70	2,426	578	C	596	C
U.S. 70	West of Holloman AFB (Main Gate)	2,650	351	A	352	A
U.S. 70	Holloman AFB (Main Gate) to U.S. 54	3,975	1,349	B	1,491	B
U.S. 54/U.S. 70	U.S. 54/U.S. 70 Junction to 1st Street	3,280	1,508	A	1,568	A
U.S. 54/U.S. 70	1st Street to Indian Wells Road	2,460	1,297	B	1,366	B
U.S. 54/U.S. 70	Indian Wells Road to Fairgrounds Road	2,460	888	A	948	A
U.S. 54/U.S. 70	Fairgrounds Road to U.S. 82	2,460	588	A	648	A
U.S. 54/U.S. 70	U.S. 82 to U.S. 54/U.S. 70 Junction (Tularosa)	2,650	864	B	883	B
U.S. 70	East of U.S. 54 (Tularosa)	1,773	358	A	367	A
U.S. 54	North of U.S. 70 (Tularosa)	1,436	234	B	252	B
U.S. 82	East of U.S. 54 (2 miles)	2,000	540	C	558	C
Relief Route	Entire route	4,220	885	A	963	A

Notes: Rolling terrain, 20 percent no-passing, 50-50 directional split used in determining capacity of two-lane segments.
LOS = Level of Service
PHV = peak hour volume
vph = vehicles per hour

Construction activities at Holloman AFB would be wholly contained within the base boundaries; no impact on vehicle traffic on public roadways would be expected. Movement of construction equipment on public roadways would be of minor scope, and no significant impact on traffic flow would be expected from this source.

Oscura and Red Rio Target Complexes. Installation and operation of the TOSS systems at Oscura and Red Rio would be wholly contained within the boundaries of WSMR; no impact on vehicle traffic on public roadways would be expected. Movement of construction equipment on public roadways would be of minor scope, and no significant impact on traffic flow would be expected from this source.

4.10.1.2 Impacts Common to NTC Training Options

Changes in airspace and range munitions use would not result in a change in traffic on any transportation route other than that described for the proposed action in general. Construction and operation of an NTC at either the West Otero Mesa or Tularosa Basin site would be wholly contained within the boundaries of McGregor Range; no impact on vehicle traffic on public roadways would be expected. Movement of construction and maintenance equipment on public roadways would be of minor scope, and would not adversely affect traffic flow.

4.10.1.3 Impacts Specific to the West Otero Mesa Training Option

Construction and operation of an NTC at the West Otero Mesa site would have no effect on transportation other than that as described above.

4.10.1.4 Impacts Specific to the Tularosa Basin Training Option

Construction and operation of an NTC at the Tularosa Basin site would have no effect on transportation other than that as described above.

4.10.1.5 Impacts Specific to the Existing Range Training Option

Implementation of the Existing Range training option would result in no change in transportation other than that described for the proposed action in general.

4.10.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have no effect on transportation, and the above-stated conclusions would remain unchanged.

4.10.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in personnel at Holloman AFB or in the area population. As a result, no effect on transportation would result from the implementation of this alternative.

4.11 UTILITIES

Changes in population can affect utility demand (e.g., water supply). Such potential impacts are discussed in the following sections. In some cases, construction and other earth-disturbing activities can also affect utility supply. Where applicable, such impacts are also discussed. Overall, no significant impact to utility systems would result from implementation of the preferred training option of the proposed action (West Otero Mesa NTC).

4.11.1 Proposed Action

4.11.1.1 Impacts Common to All Training Options

Direct and indirect changes in future utility demand resulting from implementation of the proposed action were estimated based on historic and per capita average daily use on Holloman AFB, in Otero County, and in the City of Alamogordo. These factors were applied to projections of numbers of future residents and employees associated with the proposed action.

Holloman AFB. This analysis addresses impacts to water supply, wastewater, solid waste, electricity, and natural gas.

Water Supply. Potable water requirements at Holloman AFB would increase as a result of the increase of on-base personnel and operational activities associated with the maintenance of the 30 Tornado aircraft. Potable water consumption estimates developed based on building type and daily population identified a requirement of 0.16 mgd. Under the proposed action, potable water consumption in FY00 would increase from a baseline of 2.14 to 2.30 mgd. Adequate facility equipment capability is available from the existing base water supply system to meet the demand associated with the GAF requirements. An analysis of the base distribution system indicated the need to increase the size of three pipe segments (USACE, 1996b).

Availability of supply data indicated that existing sources of potable water are adequate to meet the additional demands associated with implementing the proposed action. This conclusion is based on population proportions, existing supply, ongoing long-term availability efforts, facility upgrading, conservation, and recycling. Baseline population projections for Holloman AFB, while not directly including GAF, do incorporate appropriate projections for on-base personnel. Under

these scenarios, Holloman AFB populations would not significantly increase with implementation of the proposed action. Total water demand is projected to remain substantially static. Existing sources of surface water and groundwater supply are adequate to meet the short-term requirements of Holloman AFB.

The long-term availability of groundwater resources in alluvial fans and canyons of the Sacramento Mountains is a subject of ongoing investigation. To meet long-term demand, new or additional sources of potable supply will be required. Hydrologic and geophysical studies are being actively pursued in the south foothills area of the Sacramento Mountains (Grapevine and Pipeline Canyons). It is anticipated that new sources of supply will be found and developed over the next decade. Desalinization projects on McGregor Range, using geothermal energy sources, could provide a new source of potable water within the Tularosa Basin. To ensure long-term adequacy of supply, demands on the groundwater resource need to be balanced with recharge (e.g., safe-yield management practices). A current USGS study, funded jointly by the City of Alamogordo and the U.S. Air Force, has as one of its goals the determination of the recharge rate in the eastern Tularosa Basin (Kernoble, 1996).

Implementation of facility retrofit, upgrade, conservation, and recycling measures could free up to 1,500 AFY of potable water for use on Holloman AFB. Demolition or retrofitting of older buildings and facilities could result in cumulative reduction in water demand. Based on figures from other facilities (e.g., Fort Huachuca), a 50 percent reduction in per capita demand is not unreasonable.

Standard conservation and recycling measures are applicable to water use in the Tularosa Basin. The major use of irrigation water on Holloman AFB is the base golf course. Recent reductions in water use have been achieved through repair of a major leak in the irrigation system and the use of more efficient application schedules (e.g., nighttime watering, etc.). Further reductions in water use are possible by substituting more efficient grasses and other vegetation for existing plants. Options for further reducing water use at the golf course will be examined as part of the implementation of the base Integrated Natural Resource Management Plan.

Wastewater. Wastewater flows at Holloman AFB would increase by approximately 0.14 mgd as a result of the additional personnel and facilities needed to operate and maintain additional Tornado aircraft. The total estimated flow in FY00 is estimated to increase from 1.15 to 1.29 mgd. The base's treatment plant has a capacity to treat 1.5 mgd and would be able to process the increased flow. Furthermore, the current discharge plan for the wastewater treatment plant at the base is permitted for 1.5 mgd, which can accommodate the additional discharge anticipated with this project without requiring modification of the permit. Improvements to the lift station at Delaware and Third Street would be required (USACE, 1996b). Continuing efforts to reduce infiltration/inflow will tend to reduce the projected flow. Preliminary

results from an ongoing study indicate that substantial reductions are possible with relatively small investment.

Within the Tularosa Basin, approximately 55 percent of the total annual water imports remain available as return flow (Livingston Associates, 1997). At present, this source is not fully used. Site-generated wastewater is currently discharged to Lake Holloman, Lagoon G, and constructed wetland ponds, and is considered an underused resource. In the specific case of Holloman AFB, base-generated wastewater is routed to several natural playas (Lake Holloman and Stinky Playa) where it is allowed to evaporate or seep to the shallow groundwater. Similar conditions exist for storm water where the resource is channeled to downgradient playas. Water recycling measures for wastewater and storm water represent a potentially significant water resource. Implementation of simple conservation and recycling measures could generate as much water as developing a new well field. The resultant reduced demand may result in reductions in groundwater pumping, as an increase in supportable population, or by reductions in capital expenditures for new wells and infrastructure. Use of reclaimed water on common areas, turfed areas, golf courses, and recreational facilities could reduce per capita demand.

Only limited reuse of Holloman AFB wastewater effluent is possible, for several reasons. First, the effluent salinity is somewhat high because of the natural concentration of salts in wastewater and the infiltration of saline groundwater into the sanitary sewer collection system. An infiltration/inflow study to be completed in 1998 will be used to develop a plan to reduce infiltration/inflow, but some will always occur when groundwater with TDS>10,000 ppm is within 2-10 feet of the ground surface. This means that effluent must be mixed with potable water for effective irrigation. Second, the effluent discharged to the Holloman lakes and wetlands area supports a regionally significant waterfowl habitat used by a number of sensitive and protected species. Diversion of this water to other uses was judged to be a significant environmental impact in a previous environmental analysis (Air Force, 1995). A Section 7 consultation with USFWS (Endangered Species Act) would undoubtedly be required to divert a substantial amount of water. Finally, the infrastructure is currently unavailable to provide effluent to the golf course and could not be available for at least five years, given current funding levels and priorities.

<u>Solid Waste.</u> Solid waste generated on Holloman AFB as a result of the additional GAF activities would result in an additional 0.97 ton/day. By FY00, it is estimated that the base would increase solid waste disposal from 11.9 tons/day to 12.68 tons/day and recycling/composting would increase from 3.0 to 3.19 tons/day. Demolition wastes from the removal of Buildings 107, 289 and 291 (27,200 square feet) are estimated to be approximately 2,600 cubic yards. It is estimated that 1,135 cubic yards of concrete and 3,172 cubic yards of asphalt would be generated from the installation of utility systems and the expansion of the airfield apron.

Electricity. Estimates of the demand for electricity at Holloman AFB for GAF facilities were developed based on building size and the load anticipated for the type of facility. Electrical requirements are estimated to average approximately 3,100 kilovolt-amperes (kVA) for the GAF facilities. Holloman AFB's overall electrical requirement would increase from 236,200 kWh/day to 268,060 kWh/day. Analysis of the existing base infrastructure indicated the need to add cooling fans to the substation to increase its capacity from 22 MVA to 30 MVA to meet industry and U.S. Air Force requirements (USACE, 1996b).

Natural Gas. Estimates of the natural gas demand at Holloman AFB for GAF facilities were developed based on building size and the load anticipated for the type of facility. Natural gas requirements are estimated to average approximately 60 mcf/day for the GAF facilities. Holloman AFB's overall natural gas requirement would increase from 1,033 to 1,093 mcf/day. Analysis of the existing base infrastructure did not identify any changes necessary to meet industry and U.S. Air Force requirements (USACE, 1996c).

Oscura and Red Rio Target Complexes. All training options under the proposed action include establishment of TOSS components at the Oscura and Red Rio target complexes. The TOSS components are unmanned and would have negligible utility requirements. As a result, their installation and use would have no effect on utility demand.

Alamogordo. The proposed action has the potential to affect water supply, wastewater, solid waste, electricity, and natural gas supply and demand within Alamogordo.

Water Supply. Potable water requirements in the City of Alamogordo would increase by 0.44 mgd in FY00 as a result of in-migrating population. This six percent increase includes the requirements associated with the GAF families living within the service area of the City of Alamogordo. The estimated average daily demand for the city's potable water system would increase to 8.14 mgd. With current treatment capacity at 10.0 mgd, the city would be able to meet the increased demand.

Project-related impacts on the availability of water supply within the City of Alamogordo have not been found to be significant. Project implementation would result in a net population increase; however, the number of relocations would not be significant in comparison with the City of Alamogordo as an entity. The off-base water supply improvements discussed for Holloman AFB would also apply to Alamogordo. The additional demand for potable water is projected to result in less than five percent increase in system deliveries. The existing treatment and delivery infrastructure would not be significantly affected.

Wastewater. Wastewater treatment requirements for the City of Alamogordo would increase by 0.18 mgd as a result of GAF families residing within the city's service area and secondary growth effects. The total estimated flow would increase from 3.1

to 3.28 mgd in FY00; this is within the city's wastewater treatment plant capacity of 4.0 mgd and no significant impact on wastewater treatment would be expected.

Solid Waste. Solid waste generated by the in-migrating population and secondary growth would equal 6.76 tons/day. By FY00, the total solid waste disposed at the Otero/Lincoln County landfill would increase from 198 to 205 tons/day. This 3.3 percent increase would have a slight effect on the life span of the county landfill.

Electricity. Consumption of electricity within the City of Alamogordo is estimated to increase by 10,220 kWh/day as a result of an estimated 592 new households associated with the proposed action. TNP provides service to over 16,100 residential customers and in FY00, daily consumption would equal 603,500 kWh. This increase of 1.69 percent would be adequately met by the existing electrical infrastructure. It is assumed that all new households would be within the City of Alamogordo and not in rural areas. There would be no direct effect to the Otero County Electric Transmission Cooperative since their service area includes the rural portions of Otero, Lincoln, and Chaves counties.

Natural Gas. Natural gas consumption within the City of Alamogordo is estimated to increase by 98.5 mcf/day as a result of an estimated 592 new households associated with the proposed action. In FY00, PNM estimates they will be providing service to over 12,500 residential customers with an estimated demand of 2,106 mcf/day. The increase due to GAF would be adequately met by the existing natural gas infrastructure. PNM indicated that they have adequate supplies to meet existing peak demands as well as those anticipated in the future.

4.11.1.2 Impacts Common to NTC Training Options

Under the NTC training options, the NTC would be unmanned, thus minimizing utility demand. Only the TOSS system would be powered; its electrical demand would be met by solar-powered storage batteries. As a result, operation of the NTC would have no effect on utility demand.

4.11.1.3 Impacts Specific to the West Otero Mesa Training Option

Construction and operation of the West Otero Mesa NTC site may affect portions of the existing pipeline system that supplies untreated water to stock watering tanks on Otero Mesa. As project-specific plans are developed, mitigation measures are expected to be instituted to ensure continued delivery of water through the pipeline on Otero Mesa. Those structures currently within the NTC safety area that might be negatively impacted would be relocated if the West Otero Mesa training option is implemented. Appropriate coordination with BLM on this water resource would be conducted should this training option be implemented.

Water for construction purposes would be brought to the West Otero Mesa site by contractor and not withdrawn from the pipeline. Supplies are available to the McGregor and Doña Ana Base Camps and from other state-licensed utilities.

4.11.1.4 Impacts Specific to the Tularosa Basin Training Option

Construction of an NTC at the Tularosa Basin site would not result in a change in utility supply or demand in the affected area. As project-specific plans are developed, measures are expected to be instituted to ensure continued delivery of water. Those structures currently within the NTC safety area that might be negatively impacted would be avoided. Appropriate coordination with BLM on this water resource would be conducted should this training option be implemented. As a result, no impact to this resource would be expected other than that described for the proposed action in general. The Tularosa Basin site is in a different sub-watershed than those capturing surface water for distribution on McGregor Range. Activities conducted within this sub-watershed would be carried out using appropriate permit and erosion control measures. Therefore, construction, operation, and maintenance would be expected to have no impact on the quantity or quality of surface water delivered via inner basin transfer to McGregor Range impoundments.

4.11.1.5 Impacts Specific to the Existing Range Training Option

Impacts to utilities under the Existing Range training option would be the same as those described under impacts common to all training options. No significant impact to utilities would be expected under this option.

4.11.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have no effect on utility supply or demand, and the above-stated conclusions would remain unchanged.

4.11.2 No-Action Alternative

Implementation of the No-Action alternative would result in no change in activities at Holloman AFB, at any existing range, or within any existing airspace. As a result, this alternative would have no adverse effect on utility supply or demand in any area.

4.12 SOILS

Soils can be affected through earth-disturbing activities such as construction or changes in munitions expenditure at a range, which may affect soil erosion rates. Impacts to soils from such sources are discussed in the following sections. Overall, implementation of the preferred training option (West Otero Mesa NTC) would not result in a significant change in soil loss at Holloman AFB or any of the existing target areas. At the West Otero Mesa NTC site, in the absence of erosion control, net soil loss during construction would be approximately 14 tons/acre/year. During operational use of this NTC, the net soil loss due to water and wind erosion would be approximately six tons/acre/year.

4.12.1 Proposed Action

4.12.1.1 Impacts Common to All Training Options

Holloman AFB. Except for the proposed 15-acre munitions storage area location, soils at construction sites are largely devoid of vegetation since they have been previously disturbed or compacted. Considering their current state, the construction of new facilities under the proposed action would cause little additional impact to these soils.

As part of implementing the proposed expansion, SWPPPs would be developed for construction sites as required. The existing base SWPPP would be appropriately modified and implemented. The base SWPPP includes developing measures to prevent spills and incidental leaks from vehicles. Drip pans are required for all government vehicles. Containment is required for all petroleum product storage locations. Any storage of materials outside must include measures to prevent pollution of storm water, such as providing covers. Hazardous materials must have full containment and cannot be used around storm drains. Regular inspections and quarterly sampling of storm water runoff are conducted to verify compliance. Thus, implementation of the proposed action should not cause significant indirect impacts to soils due to the additional personnel and equipment at the base. Impacts to soils along drainage stretches and to the saline playa soils would be minor.

Soils in the vicinity of Holloman AFB contain gypsum, which is prone to erosion. Design and construction of the new facilities would include measures to avoid impacts on existing base facilities. For example, new construction on the base would take into consideration impacts on local drainage to avoid creating conditions that would lead to problems with slope stability that might affect the integrity of existing on-base facilities. Proposed facility construction would be performed in compliance with the NPDES general permit for construction sites, which does not allow slopes to remain unstabilized after completion of construction.

Oscura and Red Rio Target Complexes. Under the proposed action, TOSS components would be installed at the Red Rio target area, including a five-mile long fiber-optic cable. Installation of the TOSS components would not require excavation, and impacts to soils from this source would be negligible. Trenching required for installation of the fiber-optic cable would disturb less than 10 acres of land. The affected area, however, is within the disturbed area adjacent to existing roadways. Soil impacts from this source are considered negligible.

4.12.1.2 Impacts Common to NTC Training Options

Existing Target Complexes. Under the proposed action, inert munitions expenditures would increase at the Oscura and Red Rio impact areas and at Melrose Range, and would be reduced at the existing target on McGregor Range. The affected soils are currently disturbed due to existing use. The disturbance created by inert munitions is very small, localized, and isolated. These disturbances are not large enough for water flow to build up momentum and are easily revegetated from surrounding areas. However, range maintenance generally causes the most of the disturbance on ranges where inert munitions are used. The firebreaks and access roads consist of long, continuous disturbances that tend to form gullies and are vulnerable to wind erosion. Erosion control (e.g., check dams, detention ponds) or measures to correct erosion (e.g., as part of routine maintenance) would be considered if warranted. Thus, the proposed changes in munitions expenditures, associated ordnance clearance, and firebreak/road maintenance would have negligible impact on soils. Reduction of munitions expenditures at McGregor Range would have a slight but positive effect on soils, would be sufficient to allow revegetation to occur, and would thereby reduce erosive soil losses from that site.

Implementation of the proposed action would result in an increase in live munitions drops at the Red Rio LDT. Soil disturbance from the explosion of live munitions (as well as site maintenance activities) is focused on the center of the LDT, where most vegetation has been destroyed, and drops off significantly with distance. Historical data indicate that all live impacts on the site are confined to the area within a 3,300-foot radius of the target center. The projected increased use of the LDT would be expected to increase the area of vegetational loss, thereby increasing erosional soil loss in the area. Past use of the LDT has led to negligible soil contamination by uncombusted explosives (TNT) ordnance residue (U.S. Air Force, 1994c). The increased use of live ordnance on the LDT could lead to increased contamination.

New Target Complex. Direct impacts to soils within the impact area would occur during the installation of the TOSS components; no soil excavation would be required, and soil disturbance would be negligible for this source. Soil contamination at the NTC would be negligible because fluids would be removed from target vehicles and target installations would not contain hazardous materials. A safety area measuring 12 by 15 miles would surround the target complex (110,080 acres, not including the target complex).

4.12.1.3 Impacts Specific to the West Otero Mesa Training Option

Except for the northern tip of the site where the erosion potential is moderate to high, the West Otero Mesa site has a low to moderate potential for soil erosion by water (Figure 4.12-1 and Table 3.12-1). The potential for wind erosion of disturbed soils is high throughout most of the site, except at the northern tip. Target construction would disturb approximately 1,024 acres. The probability of UXO being present at this site is considered slight. If UXO is determined to be present, appropriate removal and disposal would be required. Overall, approximately 20 percent of the vegetation on the West Otero Mesa site would be impacted or completely removed during construction. Vegetation and soil would be further disturbed by air-to-ground impact from inert munitions during use of the NTC. Furthermore, periodic maintenance, which requires the grooming of target areas by grading, blading, and dragging the surface, would reduce the natural tendency of the soil to form a protective crust or to revegetate. These groomed areas would be particularly prone to erosion from wind and water.

In general, soil loss by water erosion from the site under current conditions (which includes grazing) is estimated at 1 ton/acre/year based on the Universal Soil Loss Equation (see Appendix H). The estimated loss of soil by wind from the site under current conditions is 5 tons/acre/year based on the Wind Erosion Prediction Equation (see Appendix H). The amount of soil that is expected to be created annually through natural soil genesis on this site is estimated at 1 ton/acre/year. Erosion from water and wind during construction, in the absence of mitigative measures, could reach 2 and 19 tons/acre/year, respectively, based on the soil distribution shown in Figure 4.12-1 and the assumptions listed in Appendix H. Thus, the construction of the NTC would involve a net water and wind soil erosion loss of 14 tons/acre/year. This is a maximum-impact scenario and does not consider permit, construction, and erosion control measures, which would result in much lower soil loss.

Existing roads leading from the safety area to the target area would be used to install and maintain targets. It is assumed, however, that State Road 506 would be used to access Otero Mesa and that dirt roads leading south would be used to access the NTC. Parts of these dirt roads would require improvements to allow dependable, year-round access to the NTC. Disturbances for road upgrades are estimated at 80 acres over a three-month period (this includes new borrow areas for road fill material).

A perimeter road surrounding the NTC would be constructed largely on soils that have a low to moderate soil erosion potential. At the northern end of the site, the perimeter road would pass through two miles of soils that have a moderate to high potential for erosion. The net water and wind spill erosion loss (see Appendix H) due to road construction would be 15 tons/acre/year. Construction of the perimeter road, and the upgrading of existing dirt roads, would require careful engineering in erosion-prone areas to protect the roads and the environment from excessive erosion by flowing water.

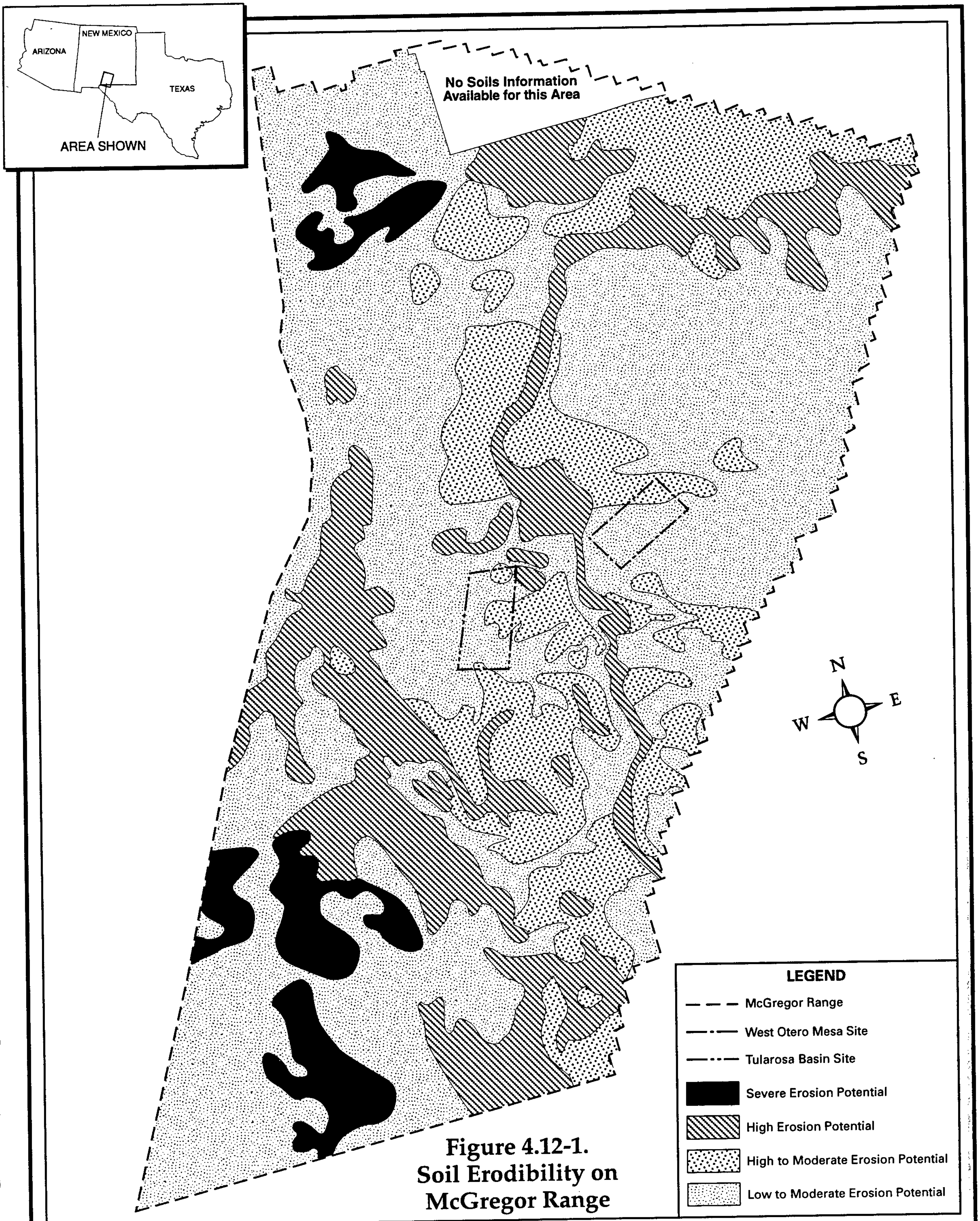

Figure 4.12-1. Soil Erodibility on McGregor Range

The post-construction phase of the NTC would include the natural process of plant growth re-establishment in the area. During operational use of the target area, net water and wind soil erosion would stabilize at approximately six tons/acre/year.

Operations and maintenance at the West Otero Mesa site could cause rangeland fires, especially from the use of tracer ammunition. Self-protection flares and the spotting charges used to score impact accuracy of inert training ordnance pose very low fire risk. In 1996, five separate fires occurred at the Red Rio impact area, started chiefly by tracer ammunition, burning a total of 1,250 acres. If large areas of vegetation are burned, the exposed soil is more easily eroded by strong winds and flowing water. Depending on the areal extent of the burn and topography, soil erosion could be severe. Several small areas at and near the West Otero Mesa site have been burned within the past several years, but the terrain is flat and excessive soil erosion is not apparent in the burned areas.

4.12.1.4 Impacts Specific to the Tularosa Basin Training Option

The erosion potential of almost the entire northern half of the Tularosa Basin site is moderate to high, with the remainder of the site classified as having a low to moderate potential for soil erosion. The estimated loss of soil by water erosion from the site under current conditions is 0.6 ton/acre/year based on the Universal Soil Loss Equation (see Appendix H). Estimated soil loss by wind from the site under current conditions is 8 tons/acre/year based on the Wind Erosion Prediction Equation (see Appendix H). The amount of soil expected to be created annually through natural soil genesis on this site is estimated at three tons/acre/year. Erosion from water and wind during construction (which includes soil disturbance from the clearance of UXO from the site), in the absence of mitigative measures, could reach 2 and 57 tons/acre/year, respectively, based on the soil distribution shown in Figure 4.12-1 and the assumptions listed in Appendix H. Thus, the construction of the NTC would involve a net water and wind soil erosion loss of 47 tons/acre/year. This is a maximum-impact scenario and does not consider permit, construction, and erosion control measures, which would result in much lower soil loss.

The Tularosa Basin site is characterized by the presence of UXO and debris from the current use of McGregor Range for weapons training. Soil disturbance activities would be significantly more intense during this process than that described for the West Otero Mesa site. Complete removal of all vegetation from the two by four mile area would result in significant soil erosion. Revegetation sufficient to significantly reduce this erosion would take several years. Following site development, however, soil loss would drop back to the rate projected for the post-construction period.

Existing roads leading from the safety area to the NTC would be used to install and maintain targets. It is assumed that either State Road 506 would be used to access the site via Otero Mesa or that the Hays Meadow road leading east and north from

McGregor Base Camp would be used to access the target area. Parts of these dirt roads would require improvements and an additional five miles of new road would be constructed to allow dependable, year-round access to the NTC. Disturbances for new roads and road upgrades are estimated at more than 80 acres over a three-month period (this includes new borrow areas for road-fill material). A perimeter road surrounding the site would pass through three to four miles of soils that are highly to moderately susceptible to erosion. The net water and wind soil erosion loss (see Appendix H) due to road construction would be 50 tons/acre/year. Construction of the perimeter road, and the upgrading of existing dirt roads, would require careful engineering in erosion-prone areas to protect the roads and the environment from excessive erosion by flowing water.

The post-construction phase of the NTC would include the natural process of plant growth re-establishment in the area. During operational use of the target area, net water and wind soil erosion would stabilize at approximately six tons/acre/year. The same rangeland fire considerations discussed for the West Otero Mesa training option would apply to the Tularosa Basin training option.

4.12.1.5 Impacts Specific to the Existing Range Training Option

Implementation of the Existing Range training option would result in increased expenditure of inert munitions at Oscura and Red Rio target complexes, Melrose Range, and the existing target area on McGregor Range. The soils in these areas are heavily disturbed. The increased use of inert munitions at these locations would not be expected to materially increase soil disturbance, either over current conditions or over levels projected for the NTC training options.

4.12.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have no effect on soils, and the above-stated conclusions would remain unchanged.

4.12.2 No-Action Alternative

Under the No-Action alternative, no construction would take place, and no change in munitions expenditures would occur. As a result, no change in soils would be expected to arise if this alternative was implemented.

4.13 SAFETY

This section discusses potential impacts resulting from proposed construction and changes in operations and use of airspace and facilities which might result in

changes in safety risks to aircrew, the public, and personnel. Analysis of flight risks correlates Class A mishap rates and bird-aircraft strikes with projected airspace use. When compared with similar data for current operations, assessments can be made of the magnitude of the safety impacts resulting from the change. Since fire and crash risk are also a function of the risks associated with mishaps and bird-aircraft strikes, those statistical data are also considered in assessing that risk. In considering munitions safety, projected changed uses and handling requirements are compared to current uses and practices. If a unique situation is anticipated to develop as a result of the proposed action, the capability to manage that situation is assessed. Fire safety impacts are assessed according to the potential for increased fire risk, and the processes and procedures developed to manage that risk or suppress fire. Regarding industrial and ground safety, the elements of the actions are considered to determine if additional risk is associated with their undertaking, and how that risk may be minimized. Elements considered include construction and maintenance activities and hazards associated with the use of lasers. Overall, implementation of the preferred training option (West Otero Mesa NTC) would not result in a significant safety risk.

4.13.1 Proposed Action

4.13.1.1 Impacts Common to All Training Options

Holloman AFB. The stationing of additional GAF personnel and Tornado aircraft at Holloman AFB would require facility construction and modification. None of these activities involve any unique or unusual procedures. Standard industrial safety practices would be followed, and control measures would be employed. No specific safety issues would be expected to arise from these activities.

Oscura and Red Rio Target Complexes. All training options under the proposed action include establishment of TOSS components at the Oscura and Red Rio target complexes. Standard industrial safety practices would be followed. No specific safety issues would be expected to arise from these activities.

Chaff and Flares. Self-protection chaff and/or flare use under the proposed action would be limited to Restricted Areas over DOD-controlled land at WSMR, McGregor Range, and Melrose Range. No chaff or flares are proposed to be used in MOAs or MTRs, and no chaff use would occur on McGregor Range under the proposed action.

Chaff consists of aluminum-coated glass fibers that reflect radar signals and, when dispensed from aircraft, form a cloud that temporarily hides the aircraft from radar detection. Chaff can be dispensed from the aircraft mechanically or by using a small pyrotechnic charge. Tornado aircraft use a nonpyrotechnic form of chaff composed of a silicon dioxide glass rod ranging in diameter from 0.7 to 1 mil (thousandth of an inch), coated by an aluminum alloy and a slip coating of stearic acid (fat). An analysis of the materials comprising chaff indicates that they are generally nontoxic

in the quantities used (U.S. Air Force, 1997d). Silicon dioxide is an abundant compound in nature that is prevalent in soils, rocks, and sands. The trace quantities of metals included in the glass fibers are not present in sufficient amounts to pose a health risk. Aluminum is one of the most abundant metals in the earth's crust, water, and air. In general, aluminum is regarded as nontoxic. Trace quantities of silicon, iron, copper, manganese, magnesium, zinc, vanadium, or titanium may be found in the alloy. The quantities involved are a minuscule percentage of levels that might cause concern. For example, the total amount of chaff used in a year would represent less than one percent of the reportable spill quantities of copper under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Stearic acid is found naturally as a glyceride in animal fat and some vegetable oils (U.S. Air Force, 1997d).

A study performed by ACC on the environmental effects of chaff and flares examined potential impacts on safety, air quality, soil and water, biological resources, land use and visual resources, and cultural resources (U.S. Air Force, 1997d). An issue concerning the use of chaff was the potential for interference with ATC radar. The potential for adverse impact is eliminated by existing procedures which require a frequency clearance and approval from FAA prior to chaff use. A test firing of chaff was conducted to determine whether chaff has the potential to break down into respirable particulates (PM_{10}). The findings of the test detected no PM_{10}.

Laboratory tests of chaff using a modified toxic characteristics leaching procedure indicated no potential for adverse effects on water or soils at quantities proposed to be used under the proposed action. Due to chaff's nontoxic composition, no adverse effects on biological resources were identified. Information was not available concerning the ability of surface or bottom-feeding waterfowl and other aquatic species to process ingested chaff. However, there are no significant water bodies supporting aquatic species or waterfowl in the target areas that would be used under the proposed action (U.S. Air Force, 1997d).

A field study of two locations where chaff is used, including a desert location where chaff has been used in quantities far exceeding those projected under the proposed action, examined the potential for chaff to accumulate and create land use or visual impacts. Chaff was found to disperse and be unnoticeable under most conditions. Occasional clumps of chaff that had not dispersed properly were found to be visible at short distances, generally less than 25 feet away. Issues regarding potential effects on cultural resources are also primarily related to accumulation and aesthetics or, in the case of Native American resources, are indirectly associated with effects on physical and biological resources. The findings on biological and visual resources, therefore, indicate that adverse effects are unlikely (U.S. Air Force, 1997d).

Self-protection flares are magnesium pellets that, when ignited, burn for a short period of time (less than 10 seconds). The burn temperature is hotter than the exhaust of an aircraft and therefore attracts and decoys heat-seeking weapons

targeted on the aircraft. The pellet is composed of a mixture of magnesium and Teflon. Some flares also have a first fire mix composed of boron, magnesium, potassium perchlorate, barium chromate, and fluoroelastomer to aid ignition. All materials are consumed when the flare burns. The first fire mix and some impulse cartridges used to ignite flares contain small quantities of chromium and/or lead, which are listed as HAP under the CAA (amended). A screening health risk assessment was performed to determine whether these emissions would present a significant health hazard. It was concluded that the number of flares that would have to be used to exceed thresholds of concern would be orders of magnitude higher than proposed under this action. Laboratory analysis of flare pellets and flare ash indicated that these materials have little potential for affecting soil or water resources (U.S. Air Force, 1997d).

The main concern with flare use is the potential for fire. U.S. Air Force regulations require that flares be released at sufficient altitudes to ensure complete combustion prior to reaching the ground. Although the potential for flare-caused fires cannot be completely discounted, WSMR, Fort Bliss, and Melrose Range have procedures in place to respond to any fires that may occur due to military activities.

4.13.1.2 Impacts Common to NTC Training Options

Flight Safety and Aircraft Mishaps. Under the proposed action, some aircraft use of the various supporting airspace elements would be redistributed relative to baseline conditions. As a result of the altered use of the airspace, some statistical predictions of the safety risk associated with flight activities in specific airspace elements may change. Data considered were described in Section 3.13.1.2. Table 4.13-1 provides flight safety data for the Tornado aircraft operating in each airspace element.

Overall, when compared to projected baseline FY00 conditions, the statistically predicted time between Class A mishaps remains unchanged in MOA airspace (regardless of the availability of the Talon MOA or IR-102/141), but decreases somewhat for some Restricted Areas and MTRs. For the NTC, the minimum predicted interval between Class A mishaps is 71.8 years. If other aircraft operations are considered to remain constant, this equates to a probability of 0.00002, indicating extremely low risk. Of all of the involved airspace, the highest risk is associated with Melrose Range (R-5104 and R-5105). However, the statistically predicted 5.3 years between mishaps in this airspace equates to a mishap probability of 0.00002, and remains unchanged from baseline conditions. Risk associated with aircraft mishaps remains insignificant.

Based on a straight-line projection of annual sorties, these data show that for the highest risk condition, there is one chance in 43,740 for a mishap in MOA airspace, one chance in 43,566 in Restricted Areas, and one chance in 31,219 on MTRs. While minimal, data indicate that implementation of the proposed action would result in overall risk of an aircraft mishap remaining relatively unchanged from the projected baseline. The increased number of flying hours associated with the

Table 4.13-1. Projected Tornado Class A Mishaps (NTC Training Options)

Airspace	Projected Years Between Mishaps (with ALCM/ Talon)	Projected Years Between Mishaps (without ALCM/ Talon)	Airspace	Projected Years Between Mishaps (with ALCM/ Talon)	Projected Years Between Mishaps (without ALCM/ Talon)
Beak A MOA	592.6	592.6	Lava East/West MOA	209.3	142.5
Beak B MOA	592.6	592.6	Mesa High MOA	663.0	663.0
Beak C MOA	592.6	592.6	Mesa Low MOA	191.9	149.1
Talon MOA	110.4	110.4	Yonder	1,739.3	226.6
Pecos High MOA	1,886.3	1,886.3	McGregor High	1,739.3	1,739.3
Pecos Low MOA	1886.3	1886.3			
Red Rio Airspace	399.8	399.8	Melrose Range	1,913.3	1,913.3
Oscura Airspace	285.0	285.0	NTC	106.0	108.1
McGregor Low	N/A	N/A			
VR-100/125	1,275.5	1275.5	IR-134/195	285.3	248.6
VR-176	212.3	212.3	IR-113	829.3	829.3
IR-133	180.4	180.4	IR-102	411.6	N/A
IR-192/194	158.7	158.7	IR-141	153.4	N/A

Note: Based on Tornado Class A mishap rate of 1.12

proposed action would not result in a statistically significant increase in the overall risk of an aircraft mishap.

Bird-Aircraft Strike Hazards. An increase in aircraft activity in affected airspace would be expected to result in an increase in risk for bird-aircraft strikes. The potential risk of bird collision is mitigated by aircrews through the BASH program. Under normal conditions when a low-level flight is planned, aircrews make adjustments to planned routes during mission planning and briefings to avoid known bird population areas. When BASH conditions are moderate or higher, all aircrews are directed to raise overflight altitudes, avoid particular low-level segments, or not fly specific low-level routes entirely to minimize the risk of bird collision. As a result, while the proposed action would increase aircraft activity in some airspace, it would not be expected to result in a significant impact to safety as a result of any potential increase in bird-aircraft strike.

Munitions Use. There would be no changes in the types of ordnance used at existing ranges under the NTC training options. However, levels of use on the affected ranges would change. These changes include live, training, and inert bombs, ammunition, chaff, and flares. Range procedures governing the delivery of this ordnance have historically resulted in safe operations. From a safety perspective, although the incidence of live ordnance delivery would increase under the NTC training options, each individual event would continue to be managed and controlled as it is under current conditions. No significantly added risk would be expected to result from the simple increased volume of operations.

In addition to the above ordnance, 2.75-inch rockets, pyrotechnic chaff, as well as illumination and self-protection flares would be expended at the various affected ranges. With the exception of pyrotechnic chaff, the proposed levels of ordnance delivery represent increases in use for all categories. However, the range operating procedures that have ensured safe operation in the past would be expected to continue to do so in the future.

The proposed NTC would support the delivery of ordnance. However, this ordnance would be limited to BDU-33s (training bombs) and other inert ordnance. No live ordnance would be authorized. Detailed range operating procedures would ensure that all delivered ordnance remains within the confines of the range. Therefore, ground safety risks associated with ordnance delivery would be minimal.

Laser targeting-equipped aircraft would operate on the proposed NTC. Use of the "combat" or hazardous mode of operation would be limited to targets and target areas specifically approved for such operations. Before any lasing activities would be conducted, the specific areas being considered would be surveyed by a bioenvironmental engineer to determine if any hazards such as reflective surfaces exist, and safe operating procedures would be established to ensure no hazardous situation develops or is present during lasing operations. Lasers operated in the "eye-safe" mode do not pose a safety hazard.

Aircraft also use radar during training operations. Radar emits radio frequency (RF) energy, which is non-ionizing energy. Emitters on an aircraft in flight pose no hazard to persons on the ground. Given the altitude and speed of the aircraft, and the RF energy levels associated with the radar's operation, any exposure to the energy field would be extremely brief, even in the unlikely event that it would occur.

Fire and Ground Safety. Developing the proposed NTC on either the West Otero Mesa or Tularosa Basin site could reasonably be expected to increase fire risk in those areas. Construction and maintenance activities might be expected to increase fire risk through ignition of vegetation due to equipment sparking, contact with hot exhausts, and other accidental sources of fire. These sources would not, however, be expected to significantly increase fire risk at the NTC site, primarily because of the limited vegetation cover in the area. At the Oscura and Red Rio target complexes there have been no known incidents of fires resulting from range maintenance activities (Hoppes, 1997b), although several fires have occurred at Red Rio from the use of certain types of munitions (e.g., tracer munitions). Such munitions would be used at the NTC and would increase fire risk at the site. Aspects of range design, such as the construction of the firebreak road around the impact area, minimize fire risk.

The potential for fires and the requirement for fire response would be considered in the planning and development of procedures governing range operations. Currently, fire response on McGregor Range is guided by the formal Standard Operating Procedures published for the range, and coordinated through and managed by the Fort Bliss Fire Department. If the NTC is developed, range personnel would be trained and equipped to support an initial fire response. Supplemental or augmented response would be coordinated through other agencies, as required. For fires that may start off-site on other portions of McGregor Range, response would remain under the direction and coordination of the Fort Bliss Fire Department, as it is currently.

4.13.1.3 Impacts Specific to the West Otero Mesa Training Option

The West Otero Mesa site is located within a portion of McGregor Range used by Fort Bliss for weapons training. While the probability of UXO being present at this site is slight, if UXO is determined to be present, appropriate removal and disposal actions would be required. Any such materials found to be present would be destroyed by qualified EOD personnel. Scrap metal would then be picked up and recycled through DRMO. Because the potential for UXO at this site is considered slight, it is not expected to present a significant human health and safety issue.

During range maintenance and periodic range grooming, the presence of UXO must also be considered. During range grooming, EOD personnel normally dispose of BDU-33s with spotting charges that failed to function.

4.13.1.4 Impacts Specific to the Tularosa Basin Training Option

Terrain restrictions at the Tularosa Basin site (notably the presence of the Otero Mesa escarpment to the east) would represent an increased risk factor for aircrew safety in this area. However, training patterns used under this option would be adapted to provide the same margin of safety as experienced for the West Otero Mesa site. These modifications would, however, also result in a limitation in training.

The Tularosa Basin site is located within a regularly used impact area associated with operations at Fort Bliss (see Section 2.1.4.4). Therefore, there is a high potential for the presence of UXO at this site. This UXO would create safety issues during range construction and maintenance activities. The Tularosa Basin site is located within a historic/existing impact area for various weapons testing and training activities on McGregor Range. As a result, the area is contaminated with debris from past missile activities and unexploded live ordnance from anti-aircraft and other artillery training activities. In order to develop a target complex on this site, the affected area would have to be decontaminated. To do this, the area would be surveyed for UXO. Any detected UXO would be detonated in place by qualified EOD personnel. Scrap metal would then be picked up and recycled through DRMO. It is assumed that the UXO survey and subsequent cleanup activities would result in major soil disturbance over the entire 5,120-acre area to a depth of up to two feet. This activity would include the complete removal of all vegetation within the two by four-mile Tularosa Basin impact area. During range maintenance and periodic range grooming, the presence of UXO must also be considered.

The presence of UXO would continue to be a safety issue following construction of the NTC. The use of spotting charges on BDU-33s would require periodic decontamination (removal of charges that failed to function) by EOD personnel in order to minimize safety risks. The Tularosa Basin site is within the area used by Fort Bliss for weapons training. Thus, there is a continuing potential for the introduction and need for removal of UXO at the site.

4.13.1.5 Impacts Specific to the Existing Range Training Option

Flight Safety and Aircraft Mishaps. Under this training option, some aircraft use of the various supporting airspace elements would be redistributed compared to the West Otero Mesa and Tularosa Basin training options. As a result, some statistical predictions of the safety risk associated with flight activities in specific airspace elements may change. Table 4.13-2 provides flight safety data for the Tornado aircraft operating in each airspace element. Overall, when compared to baseline conditions, the statistically predicted time between Class A mishaps remains unchanged in MOA airspace, but decreases somewhat for some Restricted Areas and MTRs, regardless of availability of the Talon MOA and IR-102/141. Of all of the involved airspace, the highest risk is associated with the Restricted Areas overlying Melrose Range (R-5104/5105). However, the statistically predicted 5.3 years between mishaps

Table 4.13-2. Projected Tornado Class A Mishaps (Existing Range Training Option)

Airspace	Projected Years Between Mishaps (with ALCM/ Talon)	Projected Years Between Mishaps (without ALCM/ Talon)	Airspace	Projected Years Between Mishaps (with ALCM/ Talon)	Projected Years Between Mishaps (without ALCM/ Talon)
Beak A MOA	592.6	592.6	Lava East/West MOA	209.3	142.5
Beak B MOA	592.6	592.6	Mesa High MOA	663.0	663.0
Beak C MOA	592.6	592.6	Mesa Low MOA	191.9	149.1
Talon MOA	110.4	2,678.6	Yonder	1,739.3	226.6
Pecos High MOA	1,886.3	1,886.3	McGregor High	1,739.3	1,739.3
Pecos Low MOA	1886.3	494.2			
Red Rio Airspace	399.8	399.8	Melrose Range	167.7	167.7
Oscura Airspace	285.0	175.1	NTC	N/A	N/A
McGregor Low	558.0	558.0			
VR-100/125	318.1	318.1	IR-134/195	2,889.5	1,860.1
VR-176	217.7	88.0	IR-113	117.6	117.6
IR-133	155.8	151.0	IR-102	1,322.8	N/A
IR-192/194	1,263.5	722.0	IR-141	639.9	N/A

Note: Based on Tornado Class A mishap rate of 1.12

in this airspace equates a mishap probability of 0.00002, and remains unchanged from baseline conditions. All other changes reflect less change; risk associated with aircraft mishaps remains insignificant.

Bird-Aircraft Strike Hazards. An increase in aircraft activity in affected airspace would be expected to result in an increase in risk for bird-aircraft strikes. In order to minimize the bird-aircraft strike hazard, the U.S. Air Force evaluates the risk of bird-strike for all military airspace on an ongoing basis. Results of these evaluations are provided to aircrews prior to flight, and are used in flight planning to minimize bird-aircraft strike hazard. As a result, while the proposed action would increase aircraft activity in some airspace, it would not be expected to result in a significant impact to safety as a result of any potential increase in bird-aircraft strike.

Munitions Use and Handling. There would be no change in the types of ordnance used under this training option. However, levels of use on the existing ranges, targets, and target complexes would change. These changes include live, training, and inert bombs, ammunition, chaff, and flares. The use of live ordnance would be identical to that described for the NTC training options. Implementation of the Existing Range training option would not affect safety considerations in a way different from that described in general for the proposed action. The use of inert ordnance would increase, however, over that described for the NTC training options. This increase would not alter safety issues at the existing ranges, and no significant impact would be expected to result from the increased usage levels. Range cleanup requirements would remain essentially the same as described for the other training options, and no significant impact would be expected from this source.

Fire and Ground Safety. Since no NTC would be developed under this option, fire and ground safety issues would be identical to baseline conditions. While some fire and ground safety risks are inherent in the operation and maintenance of any air-to-ground range, the existing operating procedures have proved sufficient to manage this risk and should continue to maintain that risk at minimal levels. No unique fire or ground safety risks would be associated with this training option.

4.13.1.6 Airspace Modifications Under Consideration

In the event that the ALCM/Talon action is not implemented, or is not implemented at the time the proposed action commences, sorties projected to fly in the ALCM/Talon airspace would be redistributed to existing MTRs and MOAs as described in Chapter 2.0. These changes would have a minimal effect on safety conditions, and the above-stated conclusions would remain unchanged.

4.13.2 No-Action Alternative

Implementation of the No-Action alternative would result in no construction, no change in airspace use, and no change in munitions expenditure. As a result, this alternative would have no adverse effect on safety conditions.

CHAPTER 5.0

CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.1 CUMULATIVE EFFECTS

This section provides (1) a definition of cumulative effects, (2) a description of past, present, and reasonably foreseeable actions relevant to cumulative effects, (3) an assessment of the nature of interaction of the proposed action with other actions, and (4) an evaluation of cumulative effects potentially resulting from these interactions.

Definition of Cumulative Effects. CEQ regulations direct that the cumulative effects analysis within an EIS should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Recent CEQ guidance in *Considering Cumulative Effects* affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with the proposed action. The scope must consider geographic and temporal overlaps among the proposed action and other actions. It must also evaluate the nature of interactions among these actions.

Cumulative effects are most likely to arise when a synergistic relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in close proximity to the proposed action would be expected to have more potential for a relationship than actions that may be geographically separated. Similarly, actions that coincide, even partially, in time would tend to offer a higher potential for cumulative effects.

To identify cumulative effects, this EIS analysis addresses three questions:

1. Does a relationship exist such that elements of the proposed action might interact with elements of past, present, or reasonably foreseeable actions?

2. If one or more of the elements of the proposed action and another action could be expected to interact, would the proposed action affect or be affected by impacts of the other action?

3. If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the proposed action is considered alone?

In this EIS, an effort has been made to identify all actions that are being considered and that are in the planning phase at this time. To the extent that details regarding such actions exist and the actions have a potential to interact with the proposed action in this EIS, these actions are included in this cumulative analysis. This approach enables decisionmakers to have the most current information available so that they can evaluate the environmental consequences of the proposal to beddown Tornado aircraft and train GAF personnel at Holloman AFB.

Past, Present, and Reasonably Foreseeable Actions. This EIS applies a stepped approach to provide decisionmakers with the cumulative effects of the proposed action together with the contribution of past, present, and reasonably foreseeable actions. Each of the environmental resources identified in developing this EIS, including those identified in public and agency comments, is addressed using this stepped approach. The past, present, and reasonably foreseeable actions and the point of reference and baseline years associated with these actions are presented below.

<u>Past Actions: Actions that Resulted in the FY95 Point of Reference.</u> Holloman AFB is an active military installation that undergoes continuous change in mission and in training requirements. This process of change is consistent with the United States Defense policy to be ready to respond to threats to American interests throughout the world. An FY95 point of reference has been included throughout this EIS, and in this cumulative impact analysis, as a point in time when information regarding those changes could be obtained for environmental resources identified as most important by public and agency reviewers of the DEIS. A series of past actions led to the FY95 point of reference. These actions included relocating F-117/F-4 aircraft and the establishment of the HH-60 Rescue Squadron at Holloman AFB, the deactivation of U.S. Air Force F-15 and T-38 aircraft at Holloman AFB, and the assignment of F-111 aircraft to Cannon AFB. These actions, while adding to the cumulative impact of the proposed action, were independent of the proposed action. The environmental effects of implementing these actions were previously and separately analyzed under NEPA. The FY95 point of reference represents a "snapshot" of the environmental resources associated with Holloman AFB and areas affected by activities and training flights from the base.

<u>Present Actions: U.S. Air Force Approved Mission Changes Leading to the FY00 Baseline.</u> Several actions have occurred or have been approved by the Air Force to occur at Holloman AFB or in associated airspace during the period between the FY95 point of reference used in this EIS and the FY00 baseline year that represents environmental conditions prior to full implementation of the proposed action at Holloman AFB. These actions are integrated throughout the environmental analysis by being separately identified in Section 2.3.1 and addressed in Chapter 3.0 as part of the baseline discussion for each environmental resource. These actions include changes in U.S. Air Force

missions that have been approved for the region of influence (ROI) between the FY95 point of reference and the FY00 baseline. If implemented, these actions would add to the cumulative impact of the proposed action; they are, however, independent of the proposed action. The environmental effects of implementing these actions were previously and separately analyzed under NEPA. The following approved actions are part of the FY00 baseline:

- Beddown of 12 GAF Tornado aircraft at Holloman AFB.

- Replacement of 99 PAA F/EF-111 aircraft assigned to the 27th Fighter Wing at Cannon AFB with 54 PAA F-16 aircraft.

- Completion of the Taiwanese Air Force Training program at Holloman AFB and deactivation of the 435th Fighter Squadron.

- Consolidation and conversion of six MTRs originally established for ALCM tests to low-level training routes, modifications to Talon MOA, and establishment of a new aerial refueling anchor to support units at Holloman AFB. This has been approved by the Air Force but is pending FAA approval. In recognition of FAA's decision process, this impact analysis addresses proposed training that would make use of these airspace modifications and proposed training if these airspace modifications were not implemented.

<u>Reasonably Foreseeable Actions that Interact with the Proposed Action.</u> From the initial announcement of a proposed action, time is required to complete the scoping process to obtain public and agency inputs to the analysis, to prepare and distribute a DEIS for public and agency comment, to distribute a Final EIS for review by decisionmakers. During this time, other actions have been proposed that are independent of the proposed action in this EIS and the other actions known and addressed in the DEIS. Recognizing that many, if not all, of those other actions are at very preliminary planning stages, and that very little data may be available at this time to fully analyze their impacts in detail, this Chapter identifies and addresses three types of actions that may have cumulative consequences in conjunction with implementation of the proposed action. Each category is described below and addressed for appropriate environmental resources in the following section.

- **Recently Proposed U.S. Air Force Mission Changes**. This category of actions includes U.S. Air Force actions that have been identified since the publication of the DEIS. Potential cumulative environmental consequences are addressed for each of these recently proposed mission changes that have a potential to coincide, either partially in time or geographic extent, with the proposed action. Information on these actions is included to determine whether these actions would, if

implemented, incrementally affect environmental resources. These recently proposed actions include:

- **Force structure changes at Cannon AFB.** The U.S. Air Force proposes to replace 24 F-16 Block 40 aircraft with 24 F-16 Block 30 aircraft. In addition, the U.S. Air Force has proposed to beddown 12 Block 52 F-16 aircraft in support of an international training activity.

- **Force structure changes at Holloman AFB.** The U.S. Air Force has proposed to inactivate the 7th Training Squadron, transferring six of its nine F-117 aircraft to the other squadrons at Holloman AFB. The remaining three F-117 aircraft will be placed in attrition reserve as backup aircraft. This will result in a reduction of 221 military and 9 civilian authorizations. In addition, the 48th Rescue Squadron would inactivate and remove its six HH-60 helicopters from Holloman AFB, decreasing manpower by 167 military and one civilian authorizations. The 4th Space Warning Squadron downsizing would result in a reduction of 51 military authorizations. Total personnel changes at Holloman AFB under these actions include a reduction of 449 personnel.

- **Realistic Bomber Training Initiative (RBTI).** The U.S. Air Force has proposed changing existing military airspace and developing small emitter and scoring site facilities in support of B-1 and B-52 bomber aircrews from Dyess AFB and Barksdale AFB. This would allow the aircrews to conduct realistic, integrated training, allowing for the necessary variability that could be encountered in actual combat. The RBTI action includes airspace that is within the ROI for the proposed expansion of GAF operations at Holloman AFB. This action does not involve any force structure changes.

• **Other Military Activities at WSMR and Fort Bliss.** This category of actions includes other continuing or reasonably foreseeable military actions at WSMR and Fort Bliss. A complete listing of these actions, both ongoing and projected, is presented in Section 2.3. These representative actions include:

- Waiver renewal for supersonic flights over WSMR.

- Fort Bliss Installation Real Property Master Plan (e.g., Air Defense Artillery [ADA] Expansion).

- Land withdrawal renewal for the McGregor Range.

- **Nonmilitary Activity.** This category includes continuing and reasonably foreseeable nonmilitary activities and plans that could affect areas or resources potentially affected by the proposed action (see Section 2.3.4). These actions include ongoing federal, state, and local actions, as well as actions by private industry.

  - Alamogordo Relief Route.
  - Alamogordo Schools Bond Issue Projects.
  - Gerald Champion Memorial Hospital Bond Issue Project.
  - Wal-Mart "Supercenter" Construction.
  - Continued grazing, timber harvesting, wood gathering, and recreation on public lands.

The following sections address the cumulative relationship of present and reasonably foreseeable actions when compared incrementally in combination with past actions as reflected in the FY95 point of reference. Potential cumulative environmental consequences that might arise from the proposed action in conjunction with the additional actions are described and analyzed in this section.

5.1.1 Airspace Management

5.1.1.1 U.S. Air Force Approved Mission Changes

Changes in aircraft activity in the ROI for the proposed action will occur between FY95 and FY00 due to implementation of U.S. Air Force approved mission changes. These changes in aircraft activity contribute to a cumulative effect on airspace management in association with the proposed action. Such cumulative effects would occur in the immediate vicinity of the Holloman aerodrome and in the airspace used for training under the proposed expansion of GAF operations at Holloman AFB. These cumulative effects are discussed in the following sections.

Holloman AFB. As part of the U.S. Air Force approved mission changes, the beddown of 12 GAF Tornado aircraft, the completion of the Taiwanese Air Force training program, and deactivation of the 435th Fighter Squadron affect activity at Holloman AFB. The effect of these actions on airspace management can be seen by examining the changes in aircraft activity within the Holloman aerodrome.

- In FY95, about 68 sorties and 133 multiple patterns were flown daily at Holloman AFB.
- In FY00, the number of daily sorties decreases to about 59 compared to FY95 levels of activity, while the number of daily multiple patterns

decreases to about 112. This change did not affect Holloman AFB airspace management.

The cumulative effects at Holloman AFB of the proposed action for the FY95 point of reference and FY00 baseline are as follows:

- Implementation of the proposed action would result in an increase in aircraft activity at Holloman AFB to a daily total of about 76 sorties and 157 multiple patterns.
- The cumulative effect of the proposed action and the U.S. Air Force mission changes would be a net increase in aircraft activity above FY95 reference conditions.
- Analysis of the proposed action indicates that the projected use levels would not adversely affect military and civil airspace use in this region. The proposed action, in combination with the U.S. Air Force approved mission changes, would not contribute to an adverse cumulative impact on airspace management at Holloman AFB, as measured against either the FY95 point of reference or the FY00 baseline.

Other Airspace. The U.S. Air Force approved mission changes will affect aircraft activity in MOAs, Restricted Areas, and MTRs that would also be used by aircraft under the proposed expansion of GAF operations at Holloman AFB. The effect of the mission changes on individual airspace varies, with aircraft use in some airspace increasing, while use in others decreases. The following summarizes these changes in use of MTRs, MOAs, and Restricted Areas. These overall changes in aircraft activity are used to evaluate the cumulative effect on airspace management in the ROI.

- In FY95, 15 MTR sorties, 36 MOA sorties, and 123 Restricted Area sorties were flown daily in the airspace affected by the proposed expansion of the GAF operations at Holloman AFB.
- In FY00, the number of daily sorties will increase to 21 in MTRs, 41 in MOAs, and 133 in Restricted Areas.
- These cumulative changes in operations are not sufficient to result in any adverse cumulative impact to airspace management in the region.

The cumulative effects of the proposed action, when combined with the FY00 baseline and the FY95 reference point, are projected to be as follows:

- The proposed action, when combined with the FY00 baseline, results in 32 daily sorties in MTRs, 48 daily sorties in MOAs, and 149 daily sorties in Restricted Areas.
- This is an increase of 17 MTR, 12 MOA, and 26 Restricted Area daily sorties above FY95 conditions.

- This is an increase of 11 MTR, 7 MOA, and 16 Restricted Area daily sorties above FY00 conditions.

5.1.1.2 Recently Proposed U.S. Air Force Mission Changes

The recently proposed U.S. Air Force mission changes, if implemented, would affect aircraft operations at Holloman AFB and in other airspace in the ROI for the proposed expansion of GAF operations at Holloman AFB. The cumulative effects of these changes in mission and the proposed action, as well as the U.S. Air Force approved mission changes, are discussed for these two categories.

Holloman AFB. Descriptions of the recently proposed U.S. Air Force mission changes have not been finalized. Based on current descriptions of these actions, daily operations at Holloman AFB would be approximately five percent less than FY00 operations.

- The cumulative effect of the recently proposed mission changes, if implemented, and the proposed action would reduce the daily sorties and multiple patterns by approximately five percent at Holloman AFB.
- Implementation of the proposed action, the U.S. Air Force approved mission changes, and the recently proposed mission changes would result in cumulative aircraft operations at Holloman AFB which would be similar to those that prevailed in FY95.
- No adverse cumulative impact would be expected to result from implementation of the proposed action and the recently proposed mission changes at Holloman AFB.

Other Airspace. Aircraft operations in most other airspace in the ROI for the proposed action would be reduced under the recently proposed mission changes, if implemented. Incremental effects are projected for two airspace units.

- VR-100/125 and R-5104/5 would experience an increase in aircraft operations under the recently proposed actions. These increases would be primarily due to the mission changes at Cannon AFB.
- IR-178, which is coincident with portions of IR-102/141 but not directly affected by the proposed GAF expansion, would experience increases in operations due to implementation of the RBTI.
- These cumulative changes in operations, taken incrementally or together, are not sufficient to result in a significant adverse impact to airspace management.

5.1.1.3 Other Military Activities at WSMR and Fort Bliss

None of the other identified military activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on airspace management in the ROI for the proposed action.

5.1.1.4 Nonmilitary Activity

No nonmilitary activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on airspace management in the ROI for the proposed action.

5.1.2 Noise

5.1.2.1 U.S. Air Force Approved Mission Changes

Changes in aircraft activity in the ROI for the proposed action will occur between FY95 and FY00 due to implementation of U.S. Air Force approved mission changes. These changes will affect aircraft activity at Holloman AFB as well as in the airspace for the ROI of the proposed action.

Holloman AFB. The U.S. Air Force approved mission changes are the beddown of 12 GAF Tornado aircraft, and the completion of the Taiwanese Air Force training program and deactivation of the 435th Fighter Squadron. The cumulative effect of these actions on the noise environment can be seen by examining the changes in the area within the L_{dn} 65 dB noise contour surrounding Holloman AFB.

- In FY95, the area contained within the L_{dn} 65 dB noise contour was calculated at 40.5 square miles.
- Implementation of the approved mission changes would increase the area within this contour to 41.5 square miles. This represents the FY00 baseline.

Cumulative effects of the proposed action compared to the FY00 baseline and the FY95 point of reference are as follows:

- Implementation of the proposed action would increase the area within this noise contour by five square miles over the FY00 baseline. The total area within this contour, following implementation of the proposed action would be 46.5 square miles (see Table 5.1-1 and Figure 5.1-1).
- The cumulative effect of the proposed action and the U.S. Air Force mission changes would be to increase the area within the L_{dn} 65 dB noise contour by six square miles over FY95 conditions.

Table 5.1-1. Area within Noise Contours under the Proposed Action Compared to FY95 Conditions

Contour Level (L_{dn})	Area Contained within Various Contour Intervals			
	Square Miles			Percent Change
	FY95 Conditions	Proposed Action	Change	
65	40.5	46.5	6.0	14.8%
70	21.2	25.0	3.8	17.8%
75	10.3	12.3	2.0	19.1%
80	4.7	5.5	0.8	17.5%
85	2.1	2.5	0.4	17.7%

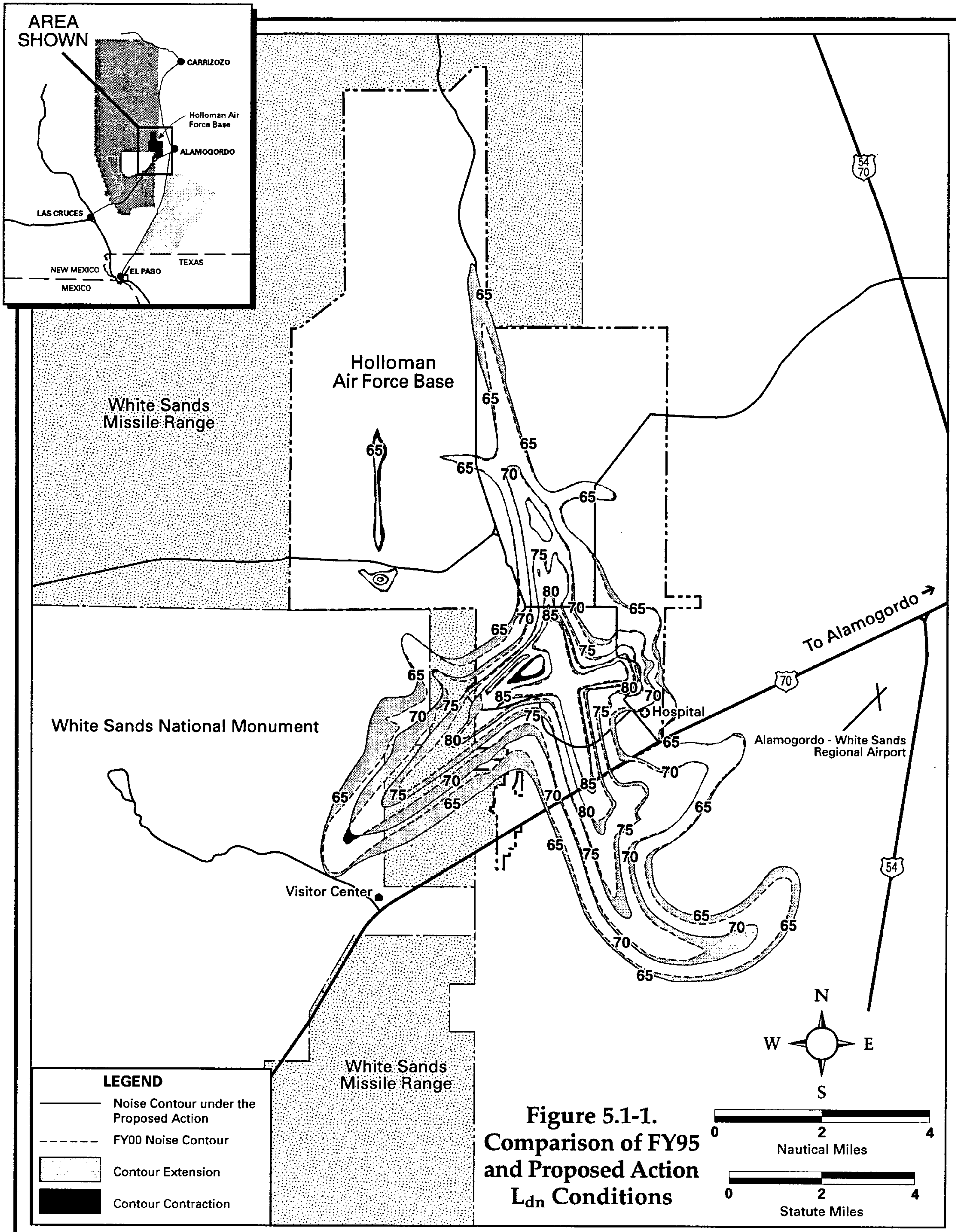

Figure 5.1-1. Comparison of FY95 and Proposed Action L_{dn} Conditions

Other Airspace. Changes in aircraft use of MTRs and MOAs within the ROI for the proposed action, summarized in Section 2.1.1.2, affect the noise environment in the underlying areas. These changes can be evaluated by considering (1) the maximum noise levels projected and (2) the changes in noise levels that occur under different conditions.

- In FY95, the maximum average noise levels that occurred in areas underlying the affected airspace was 62 dB. Noise levels in most areas were lower than this.
- In FY00, the maximum average noise levels that occur in the affected area are projected to be 63 dB. Noise levels in most areas will be lower than this.

Changes in operations due to the U.S. Air Force approved mission changes result in an increase in noise levels in much of the ROI. In most cases (53 of the 91 points examined in the noise analysis; see Figure 3.2-4 and Tables 3.2-2 and 3.2-3), the change is 2 dB L_{dnmr} or less. This change is not considered noticeable. Some locations (17 of the points examined, all in southeast New Mexico, and west Texas) show a change (8 dB or more) that is considered substantial. The cumulative effects of the MOAs and MTR airspace of the proposed action on the FY00 baseline and the FY95 point of reference are as follows:

- Implementation of either NTC training option would result in maximum average noise levels under the affected airspace of 62 dB. Noise levels in most areas were lower than this.
- Implementation of the Existing Range training option would result in maximum average noise levels of 64 dB.
- In terms of maximum average noise levels within the ROI, noise levels under the NTC training options would be similar to those that prevailed in both FY95 and FY00.
- Implementation of either NTC training option would result in an increase in noise levels in some locations of up to 7 dB above FY00 baseline conditions. In 60 out of 91 points, the change in noise would not be perceptible.
- Implementation of the Existing Range training option would result in a substantial increase in noise levels in 5 out of 91 points of 8 dB or more above FY00 baseline conditions. In 69 out of 91 points, the change in noise would not be perceptible. This is due to reductions in sortie numbers in some areas, while other areas would receive a larger number of sorties.
- The approved mission changes and the implementation of the NTC training options yield a cumulative change from the FY95 point of reference (Table 5.1-2). Under these conditions, 20 of the points considered would show a substantial increase in the noise environment of 8 dB or more. In addition, fewer points (40 out of 91) would experience imperceptible changes in noise (2 dB or less).

Table 5.1-2. Change in Onset Rate Adjusted Day-Night Average Sound Levels (L_{dnmr}) for the NTC Training Options Compared to FY95 Conditions

Reference Points	Sound Level FY95 Conditions (dB)	Sound Level NTC Options (dB)	Change (dB)
1	56	56	0
2	60	62	2
3	50	51	1
4	58	62	4
5	42	42	0
6	43	44	1
7	52	53	1
8	53	58	5
9	39	39	0
10	53	59	6
11	39	39	0
12	43	48	5
13	49	51	2
14	51	52	1
15	42	47	5
16	42	46	4
17	50	50	0
18	48	50	2
19	62	62	0
20	53	50	-3
21	53	60	7
22	38	53	15
23	38	38	0
24	38	49	11
25	37	51	14
26	41	56	15
27	46	50	4
28	52	56	4
29	55	58	3
30	50	54	4
31	53	57	4
32	49	54	5
33	47	53	6
34	50	54	4
35	50	54	4
36	42	55	13
37	40	54	14
38	42	57	15
39	53	57	4
40	41	59	18
41	35*	53	18*
42	35	50	15
43	55	56	1
44	54	56	2
45	36	37	1
46	39	43	4
47	39	43	4
48	39	43	4
49	38	42	4
50	48	46	-2
51	35*	35*	0*
52	35*	35*	0*
53	35*	35*	0*
54	46	50	4
55	35*	35*	0*
56	49	54	5
57	35*	53	18*
58	35*	56	21*
59	35*	35*	0*
60	48	54	6
61	36	42	6
62	45	47	2
63	48	52	4
64	51	53	2
65	49	54	5
66	44	46	2
67	38	38	0
68	48	45	-3
69	45	49	4
70	35*	35*	0*
71	48	54	6
72	37	47	10
73	43	53	10
74	40	54	14
75	37	53	16
76	38	38	0
77	38	49	11
78	46	49	3
79	35*	46	11*
80	35*	35*	0*
81	35*	56	21*
82	35*	40	5*
83	46	56	10
84	54	50	-4
85	35	35	0
86	50	45	-5
87	40	42	2
88	35*	35*	0*
89	35*	35*	0*
90	35*	35*	0*
91	39	41	2

* Reference point located outside region of aircraft noise. Assume a background noise environment of 35 dB.

- The approved mission changes and the implementation of the Existing Range training option yield a cumulative change from the FY95 point of reference (Table 5.1-3). Under these conditions, 15 of the points considered would show a substantial increase in the noise environment of 8 dB or more. In addition, fewer points (32 out of 91) would experience imperceptible changes in noise (2 dB or less).

5.1.2.2 Recently Proposed U.S. Air Force Mission Changes

The recently proposed U.S. Air Force mission changes, if implemented, would affect aircraft operations at Holloman AFB and in other airspace within the ROI for the proposed action. These changes would affect the cumulative noise impact, as discussed below.

Holloman AFB. The recently proposed mission changes at Holloman AFB, if implemented, would reduce aircraft operations within the Holloman aerodrome. Based on best available data for the action, noise analysis indicates that there would be no substantive change in the noise environment at Holloman AFB, given the number and type of aircraft involved. The recently proposed mission changes at Holloman AFB would not substantively change the area within the 65 dB noise contour.

Other Airspace. For most affected airspace within the ROI for the proposed action, the aircraft operations would be reduced or the increase would be a small fraction of the FY95 or FY00 levels of operation. In these cases, no significant perceptible cumulative change in noise levels is projected. This includes Cannon AFB aircraft using VR-100/125 and R-5104/5. Implementation of the recently proposed RBTI action would increase aircraft operations on IR-178. This route coincides with IR-102/141, which is part of the ROI for the proposed expansion of GAF operations at Holloman AFB.

- FY95 noise levels on the affected portions of IR-102/141 are calculated to be between 53 and 55 dB.
- FY00 noise levels on the affected portions of IR-102/141 are calculated to be about 56 dB. This increase is due to the U.S. Air Force approved mission changes.
- If the proposed action is implemented, noise levels in the affected portions of IR-102/141 are calculated to be about 56 to 57 dB (NTC training options) or 55 to 56 dB (Existing Range training option).
- If the RBTI is implemented along with the proposed action, noise levels in the affected portions of IR-102/141 are calculated to be about 59 to 60 dB.
- The projected noise levels in the affected areas of these two routes, if both the RBTI and the proposed action are implemented, are calculated to increase approximately 2 dB above FY00 baseline conditions and up to 7 dB above the FY95 point of reference noise levels.

Table 5.1-3. Change In Onset Rate Adjusted Day-Night Average Sound Levels (L_{dnmr}) (Existing Range Training Option Compared to FY95 Conditions)

Reference Points	Sound Level Conditions FY95 (dB)	Sound Level Existing Range (dB)	Change (dB)
1	56	56	0
2	60	62	2
3	50	51	1
4	58	63	5
5	42	42	0
6	43	47	4
7	52	59	7
8	53	58	5
9	39	39	0
10	53	59	6
11	39	39	0
12	43	48	5
13	49	57	8
14	51	59	8
15	42	47	5
16	42	46	4
17	50	57	7
18	48	52	4
19	62	64	2
20	53	54	1
21	53	56	3
22	38	46	8
23	38	38	0
24	38	49	11
25	37	49	12
26	41	52	11
27	46	52	6
28	52	59	7
29	55	61	6
30	50	56	6
31	53	59	6
32	49	56	7
33	47	53	6
34	50	56	6
35	50	55	5
36	42	47	5
37	40	47	7
38	42	49	7
39	53	56	3
40	41	53	12
41	35*	50	15*
42	35	43	8
43	55	56	1
44	54	55	1
45	36	37	1
46	39	43	4
47	39	43	4
48	39	43	4
49	38	42	4

Reference Points	Sound Level Conditions FY95 (dB)	Sound Level Existing Range (dB)	Change (dB)
50	48	46	-2
51	35*	35*	0*
52	35*	35*	0*
53	35*	35*	0*
54	46	51	5
55	35*	35*	0*
56	49	55	6
57	35*	45	10
58	35*	48	13*
59	35*	35*	0
60	48	55	7
61	36	42	6
62	45	50	5
63	48	53	5
64	51	58	7
65	49	55	6
66	44	47	3
67	38	38	0
68	48	45	-3
69	45	51	6
70	35*	35*	0*
71	48	54	6
72	37	40	3
73	43	45	2
74	40	46	6
75	37	50	13
76	38	38	0
77	38	49	11
78	46	53	7
79	35*	42	7*
80	35*	35*	0*
81	35*	52	17*
82	35*	38	3*
83	46	54	8
84	54	50	-4
85	35	35	0
86	50	44	-6
87	40	42	2
88	35*	35*	0*
89	35*	35*	0*
90	35*	35*	0*
91	39	41	2

* Reference point located outside region of aircraft noise. Assume a background noise level of 35 dB.

5.1.2.3 Other Military Activities at WSMR and Fort Bliss

None of the other identified military activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on noise in the ROI for the proposed action. The waiver renewal for supersonic flights over WSMR would result in a continuation of existing conditions.

5.1.2.4 Nonmilitary Activity

No identified nonmilitary activities, together with the proposed action and other recently proposed Air Force actions, are expected to have a cumulative effect on the noise environment.

5.1.3 Land Use

5.1.3.1 U.S. Air Force Approved Mission Changes

Holloman AFB: Other than on-base construction and local residential and commercial construction, the only effect of the approved mission changes at Holloman AFB would be an increase in land area within the 65 dB (L_{dn}) noise contour.

- Between FY95 and FY00, an increase of one square mile of land area within the 65 dB contour occurs primarily on Holloman AFB. A slight decrease in land area within the 65 dB and greater contours occurs on White Sands National Monument.
- This change will increase the area under the contour by five percent and is not anticipated to be noticed off the base.

The cumulative effects from the proposed expansion of GAF operations at Holloman AFB, combined with the FY00 baseline, are as follows:

- Implementation of the proposed action and approved missions would increase land area within the 65 dB noise contours on-base by 1.53 square miles and public and private off-base land area by 3.47 square miles.
- Cumulative effects to the White Sands National Monument are projected to affect approximately two square miles. Private off-base land area cumulatively exposed to 65 dB or more would increase by approximately 90 acres. This would produce a noticeable increase for both land uses.

The cumulative effects, when the proposed action and the approved actions are compared to the FY95 point of reference, are as follows:

- The cumulative effect of the proposed action and mission changes since the FY95 point of reference would be an increase of 1.61 square miles on-base and 4.39 square miles off-base in the land area within the 65 dB contour.
- Cumulative effects to the White Sands National Monument are projected to affect approximately two square miles. Private off-base land area cumulatively exposed to 65 dB and greater would increase by approximately 102 acres. This would produce a noticeable increase for both land uses.
- Cumulative effects of the Existing Range training option, when compared with the FY95 point of reference, result in no change to land use on the Otero Mesa or the Tularosa Basin.

Other Airspace: Most land areas underlying the MTRs and MOAs would receive contributions of noise and overflight from training flights associated with the proposed action. Cumulative impacts with respect to any of the training options considered for the proposed action are generally similar. Unless noted otherwise, the following applies to both the NTC and Existing Range training options.

- The proposed action, when combined with the FY00 baseline, would increase Talon MOA sorties from six per day to 10 per day. All other MOAs would have an increase of less than one sortie per day. These changes are not expected to impact land use.
- The proposed action, when compared with the FY00 baseline (see Table 4.2-5), would produce either a reduction or a slight increase in average noise of 2 dB or less (L_{dnmr}) in 60 of 91 points distributed throughout the ROI (see also Figure 3.2-4 and Table 3.2-3). This change in average noise levels would not be perceptible.
- The proposed action, when compared with the FY00 baseline (see Table 4.2-5), would produce a noise level increase of 5 to 7 dB in 11 of 91 points throughout the ROI. This noise level increase would be noticeable.
- Areas that have not experienced low-altitude military overflights, such as land underlying parts of IR-192/194, could experience frequencies of overflights comparable to those experienced on IR-134/195 where cattle grazing and ranching coexisted with military overflights for many years. This would produce a noticeable change in the noise environment.
- Relative increases in noise could be noticeable in portions of De Baca County, Otero County, Eddy County, and west Texas. These increases, where noticeable, could result in annoyance among traditional land users.
- In most areas, such an increase in noise, even if undesirable to rural residents, would be comparable to levels that have coexisted with ranching operations throughout the region.

The cumulative effects of the proposed action and mission changes since the FY95 point of reference would be greater than those of the proposed action combined with the FY00 baseline.

- Implementation of the proposed action and approved mission changes, when compared to the FY95 point of reference, would increase the Pecos Low MOA sorties from about 7 to about 17 per day and the Talon MOA sorties from about 7 to 10 per day. All other MOAs would either have a decrease or an increase of less than one sortie per day.
- Implementation of the proposed action and the approved mission changes, when compared with the FY95 point of reference, would produce an increase in noise of 2 dB or less in 40 of the 91 points used for analysis throughout the ROI (see Table 5.1-2). This noise level increase would not be perceptible.
- The cumulative effects of the proposed action and approved mission changes, when compared with the FY95 point of reference, would produce a noticeable (5 to 7 dB) noise increase in 13 of 91 points and a substantial (greater than 7 dB) noise increase in 20 of 91 points.
- Under either of the proposed options, relative noise levels in portions of Otero County, Eddy County, west Texas, Guadalupe Escarpment in Lincoln National Forest, and the Capitan Mountains would be higher than the FY95 point of reference levels.
- Implementation of the Existing Range training option and the U.S. Air Force approved actions would produce substantial cumulative noise increases over the FY95 point of reference in isolated areas between Carrizozo and Willard and underlying rural areas in De Baca County, Eddy County, and west Texas.
- Implementation of any of the training options under the proposed action would result in noise levels less than L_{dnmr} 65 dB for all locations and would generally be compatible with residential, agricultural, and recreational land uses.

5.1.3.2 Recently Proposed U.S. Air Force Mission Changes

Holloman AFB: The recently proposed U.S. Air Force mission changes at Holloman AFB, if implemented, would reduce activity below the FY00 baseline.

- There would be no construction and no change to land use on the base.
- The reduction in base sorties would have a small beneficial effect by minimally reducing the area within the 65 dB contour.

Other Airspace: The general trend, with the exception of one MTR, would be no discernible change in noise and no adverse impact on land use.

- Implementation of the RBTI on IR-178 (which overlaps IR-102/141, a route that would be used under the proposed expansion of GAF operations at Holloman AFB) would result in an increase of 2 dB or less over FY00 baseline noise levels. This noise level increase would not be perceptible.
- The cumulative noise levels would increase by 7 dB over the FY95 point of reference to a L_{dnmr} of 60 dB. This noise level increase would be noticeable to underlying rural residents.
- The predominant use of underlying areas for cattle ranching would be compatible with the projected increased noise levels.

5.1.3.3 Other Military Activities WSMR and Fort Bliss

The proposal to use ADA sites on McGregor Range to support training could affect livestock operations and recreation by periodically restricting public access to the range similar to the Roving Sands exercises. The new ADA sites would have separate environmental documentation.

- These sites would be distributed throughout McGregor Range and would decrease the total grazing area by a small percentage.
- Past use of existing ADA sites within the grazing areas does not appear to have caused a decrease in grazing value in recent years.
- No additional quantifiable cumulative effects are anticipated when considered with the West Otero Mesa training option of the proposed action.

5.1.3.4 Nonmilitary Activity

Additional planned growth in Alamogordo is not expected to cumulatively impact land use. Changes in standards and guidelines for grazing adopted by the USFS and under consideration by BLM may alter grazing allocations in the region. In some areas, the number of AUMs may be reduced.

- The reduction of AUMs, if the West Otero Mesa training option was selected, would remain a small fraction of regional grazing operations.
- No substantive cumulative effects are anticipated.

5.1.4 Air Quality

5.1.4.1 U.S. Air Force Approved Mission Changes

Holloman AFB. The U.S. Air Force approved mission changes at Holloman AFB result in a change in aircraft mix and a net reduction in aircraft activity within the Holloman aerodrome. These changes also result in a reduction in personnel, with subsequent reductions in vehicle use and commuting traffic at the base. Emissions from stationary sources and on-base vehicles at Holloman

AFB are expected to remain relatively constant between FY95 and FY00, and do not contribute to cumulative impacts due to the proposed action. The effect of the change in aircraft mix and activity at Holloman AFB includes:

- A reduction in CO and VOC emissions below the FY95 point of reference.
- An increase in NO_x, SO_x, and PM emissions above the FY95 point of reference.
- These changes are reflected in the FY00 baseline.

Implementation of the proposed expansion of GAF operations at Holloman AFB would result in an increase in aircraft activity and personnel. This would result in additional changes to the emissions of criteria pollutants, including:

- An increase in emissions for all criteria pollutants above the projected FY00 baseline.
- Short-term, construction-related impacts are not expected to result in degradation of air quality.

The cumulative effects of both the U.S. Air Force approved mission changes and the proposed action are as follows:

- A reduction in VOC and CO, as compared to the FY95 baseline.
- An increase in NO_x, SO_x, and PM emissions, as compared to the FY95 baseline.
- Emissions resulting from cumulative impacts would not be expected to cause or contribute to any exceedance of the AAQS that would lead to nonconformance with EPA's Conformity Rule or the Clean Air Act.

Other Airspace. The U.S. Air Force approved mission changes result in an increase in aircraft activity in the air quality ROI for the proposed action. This results in an overall increase in air emissions in individual AQCRs affected by the proposed action. While there is some variation between specific criteria pollutants, the following overall trends are expected:

- Implementation of the U.S. Air Force approved mission changes result in a decrease in emissions of all criteria pollutants between the FY95 point of reference and the FY00 baseline year.
- Implementation of the proposed action would result in an emissions increase above emission levels in the FY00 projected baseline.
- The cumulative effect of the proposed action and the U.S. Air Force mission changes is predicted to result in a decrease for CO and VOC, and an increase for NO_x, SO_x, and PM above the FY95 point of reference.

- All of the affected AQCRs are projected to be in attainment with federal and state AAQS under any incremental or cumulative analysis.
- Emissions resulting from cumulative impacts would not be expected to cause or contribute to any exceedance of the AAQS that would lead to nonconformance with EPA's Conformity Rule or the Clean Air Act.

5.1.4.2 Recently Proposed U.S. Air Force Mission Changes

Holloman AFB. The recently proposed U.S. Air Force mission changes at Holloman AFB, if implemented, would reduce aircraft activity at the base by approximately five percent over the FY00 baseline. There would also be a reduction in personnel levels. Implementation of these mission changes would have the following effects on air emissions in the vicinity of Holloman AFB:

- A net reduction in aircraft emissions below the FY00 projected baseline.
- A net reduction in emissions from commuting activities.

Since these changes would result in a reduction in emissions at Holloman AFB, no adverse cumulative impact to air quality would arise due to implementation of both the proposed action and the recently proposed U.S. Air Force mission changes at Holloman AFB.

Other Airspace. The recently proposed U.S. Air Force mission changes, if implemented, would involve airspace use within four AQCRs that are potentially affected by the proposed expansion of GAF operations at Holloman AFB: AQCRs 153, 154, 155, and 218.

- MAILS modeling of the proposed action for the FY95 point of reference and for the FY00 baseline was used to assess potential impacts in the two regions with the highest potential level of emissions (AQCRs 153 and 155).
- For those two AQCRs, it was concluded that the proposed action either incrementally or cumulatively would not be expected to cause or contribute to any exceedance of the AAQS or nonconformance with the EPA's Conformity Rule or the Clean Air Act.
- The recently proposed actions would result in less than a three percent change in the cumulative sorties in these same AQCRs. Such a small change would not change the conclusion of the modeling analysis.
- The recently proposed U.S. Air Force mission changes would cause an increase in sortie numbers in AQCRs 154 and 218. These increases, however, are significantly lower than those that were assessed by MAILS modeling for AQCRs 153 and 155.
- Since the analysis of AQCRs 153 and 155 indicated no exceedance of federal or state AAQS, the increase in aircraft activity in AQCRs 154 and 218 would not be expected to result in such exceedances.

Cumulative air quality impacts of the proposed action and the proposed U.S. Air Force mission changes would not be expected to cause or contribute to an exceedance of the AAQS that would lead to nonconformance with EPA's Conformity Rule or the Clean Air Act.

5.1.4.3 Other Military Activities at WSMR and Fort Bliss

The Roving Sands exercise occurs over a period of one week on McGregor Range. During that week, all other sorties in MTRs, MOAs, and Restricted Areas cease.

- Roving Sands exercises occur every year. The effects of this exercise and of all other air emissions in the region are reflected in the ambient air quality monitoring data.
- These data show maximum concentrations to be well below the national and state AAQS.
- Cumulatively combining the ambient concentration data with the concentrations found in the MAILS modeling results yields air pollutant levels well below threshold concentrations.

5.1.4.4 Nonmilitary Activity

The nonmilitary actions identified for cumulative effects analysis are small in scale, short-term, or otherwise would not contribute to an air quality cumulative effect.

5.1.5 Biological Resources

5.1.5.1 U.S. Air Force Approved Mission Changes

Holloman AFB. Cumulative effects to biological resources have the potential to occur on Holloman AFB from construction and operations at the proposed sites for training and in the associated airspace. Aircraft operations and Holloman AFB activities associated with approved mission changes are reflected as changes between the FY95 point of reference and the FY00 baseline.

Holloman AFB: Mission changes at Holloman AFB between FY95 and FY00 result in additional construction, personnel, and flight activities near the base.

- These actions primarily occur in disturbed areas either on- or off-base.
- These actions are not expected to produce significant impacts to biological resources at Holloman AFB or in the Holloman aerodrome.

The effects at Holloman AFB and the surrounding area, when the proposed action is combined with the FY00 baseline and then with the FY95 point of reference, are as follows:

- Proposed facility construction would disturb 96 acres and one small bat roost within Holloman AFB over the FY00 baseline.
- This construction, which would affect 81 acres of previously disturbed land and 15 acres of relatively undisturbed land, is not projected to result in any significant adverse impacts to biological resources.
- Measures to control water runoff from the proposed construction would result in no impact to jurisdictional wetlands.
- Cumulative impacts at Holloman AFB and within the Holloman aerodrome from the proposed action and approved mission changes, when compared to the FY95 point of reference, do not have substantial effects to biological resources on or near Holloman AFB greater than the proposed action compared to the FY00 baseline.
- Construction and operation of an NTC and access routes would directly disturb habitat and species as described in Section 4.5.
- Cumulative effects from different Air Force actions would be the same as the direct effects from the proposed action, including protected and sensitive species. Additional effects from non-Air Force military actions are described in Section 5.1.5.3.

Other Airspace. The approved mission changes affect aircraft activity in some airspace within the ROI for the proposed action.

- Aircraft activity would increase above the FY95 point of reference for most airspace, due to the approved mission changes.
- Additional aircraft activity would occur in much of the same airspace if the proposed action was implemented.
- Biota in areas underlying these airspaces would receive a cumulative impact from the combined effects of the approved mission changes and the proposed action.

In locations where there would be a cumulative increase in aircraft activity, a cumulative increase in startle effects to wildlife may occur. Wildlife, including protected and sensitive species, would be more likely to be startled by these events in areas where they would occur infrequently. However, where noise events become routine, most wildlife species may become habituated and would be less likely to exhibit a startle response to noise events. In addition, those responses would probably become less severe and be temporary. The potential for habituation has been observed for big game (Lamp, 1989; Workman and Bunch, 1991; Weisenberger et al., 1996) and raptors (Lamp, 1989; Ellis et al., 1991; Grubb and King, 1991). Overall, changes in overflight due to the approved mission changes and the proposed action are likely to result in low cumulative impacts to general wildlife species. Aircraft operational restrictions would ensure that impacts to protected species would be minimized. This conclusion applies to both the NTC training options and the Existing Range training option.

The approved mission changes result in changes in inert/subscale and live ordnance use at the Oscura, Red Rio, McGregor, and Melrose Ranges. The proposed action also affects ordnance use in these locations, and could potentially contribute to a cumulative impact to the biota.

- The projected changes in inert/subscale ordnance use, however, are not considered substantive, either for the approved mission changes or for the proposed action.
- Cumulative use of the ranges would increase (with the exception of the existing target on McGregor Range), resulting in a potential for increased vegetation and wildlife disturbance immediately surrounding the targets on the impact areas.
- These cumulative disturbance increases would be very small to general biota and protected species because the impact areas are already highly disturbed, and protected species would not likely occur in the impact areas.

The use of live ordnance at the Red Rio LDT increases under both the approved mission changes and the proposed action. This would result in a cumulative increase in area disturbed and a cumulative impact to biota.

- The level of disturbance at the Red Rio LDT in FY95 is estimated at about three acres.
- The approved mission changes increase the disturbed area to about seven acres by FY00.
- Implementation of the proposed action would further expand this disturbed area to about 10 acres.

5.1.5.2 Recently Proposed U.S. Air Force Mission Changes

Recently proposed U.S. Air Force mission changes, if implemented, would result in changes in airspace use.

- Operations would decrease at Holloman AFB and in most of the affected surrounding airspace within the biological resource ROI for the proposed action. In these areas, no adverse cumulative effect would result from implementation of the recently proposed mission changes and the proposed action.
- Two portions of airspace (VR-100/125 and R-5104/5) would experience an increase in aircraft use above that associated with the proposed action. This increase would be primarily due to the U.S. Air Force mission change at Cannon AFB.
- Portions of IR-102/141 are coincident with portions of IR-178, which would be affected by the RBTI, if implemented.
- Preliminary analysis of the best available data indicate that implementation of any of the recently proposed U.S. Air Force mission

changes, in addition to the proposed expansion of GAF operations at Holloman AFB, would not alter the conclusions reached with regard to impacts to biological resources, including protected species, presented in Chapter 4.0.

The cumulative effect of the use of these airspaces to wildlife would be an increased potential of startle from overflights. As discussed in Appendix J and previously, response by wildlife may vary from no startle response, to short-term response (e.g., flushing of birds, and running of animals, to individual animals moving large distances), to long-term responses (e.g., animals leaving the area). Research generally suggests that most animal responses are short-term with no measurable population effects.

5.1.5.3 Other Military Activities at WSMR and Fort Bliss

Cumulative effects on WSMR and McGregor Range would be associated with continued air operations, training, and weapons (e.g., missile) testing. In addition, continued supersonic flights over WSMR, the implementation of the Fort Bliss Real Property Master Plan, ADA training, and land withdrawal renewal for the McGregor Range would contribute to cumulative impacts.

- Human presence from potential increased training on McGregor Range and other training areas on Fort Bliss may result in wildlife temporarily avoiding some areas more frequently.
- Cumulative impacts from human presence would be expected to be low because most activities will be of a similar nature to current activities and most animal species in the ROI for the proposed action would probably tend to habituate to consistent disturbances.
- Additional habitat would be modified from continued missile and system testing on WSMR and Doña Ana and McGregor Ranges. Up to an additional 2,300 acres of land may be disturbed on Fort Bliss from ongoing activities (e.g., missile firings, training, and Roving Sands maneuvers) and proposed activities (e.g., helicopter and ADA training). This is in addition to the existing 67,400 acres currently disturbed.
- Vehicle travel on roads would also contribute to continued erosion, potential brush fires, potential habitat fragmentation, increased establishment of weedy, non-native species, and reduced native and perennial vegetation cover.
- The cumulative impact to vegetation from Air Force, Army, and other military activities on Fort Bliss, McGregor Range, and WSMR is projected to be approximately 3,500 acres if the West Otero Mesa training option is selected or 7,500 acres if the Tularosa Basin training option is selected.
- Cumulative impacts to protected species from other military activities on WSMR and Fort Bliss would include loss of desert grassland and shrubland habitat; increased potential for startle from overflights and

missile testing; continued disturbance from human presence; continued habitat disturbance from ground vehicles; and increased potential for brush fires.

5.1.5.4 Nonmilitary Activity

Ongoing nonmilitary activities (e.g., timber harvesting, wood collecting, recreation, and grazing) may result in noise, human presence, and habitat modification.

- These activities alter vegetation composition and structure.
- Timber harvesting and livestock grazing are integral parts of the composition and structure of wildlife habitat that occur throughout much of the ROI.
- Management practices and goals on USFS and BLM-managed lands attempt to balance livestock production, wildlife production, recreation, and other land uses.
- General urban development and increased cropping results in additional loss of native vegetation in the larger ROI that includes areas under existing airspace.
- This would continue a long-term trend of native vegetation loss and fragmentation throughout the region.
- Cumulative impacts to protected species would include continued habitat fragmentation; modification from grazing, timber harvesting, and urban development; and continued interactions with people from recreation, wood gathering, and other activities. This would likely result in startle effects to individual animals in proximity to the activities.

5.1.6 Archaeological, Cultural, and Historical Resources

As discussed in Section 4.6, the Air Force has requested, and will continue to request, information on the effects of aircraft overflight and other actions on traditional cultural properties of concern to the Mescalero Apache and other groups. An assessment of cumulative impacts on these resources would involve similar consultation. To date, information on potential cumulative impacts on traditional cultural properties has not been made available.

5.1.6.1 U.S. Air Force Approved Mission Changes

Holloman AFB. The U.S. Air Force approved mission changes at Holloman AFB include construction and related ground-disturbing activities and overflights in the Holloman aerodrome.

- Between the FY95 point of reference and the FY00 baseline, construction would occur in the developed portions of the base where no archaeological resources remain.
- Approved mission changes do not involve construction action near the existing munitions storage area where archaeological resources are present.
- No significant adverse cumulative effects to archaeological, cultural, and historical resources would arise due to the implementation of the U.S. Air Force approved mission changes.
- Changes in aircraft overflight near the Holloman aerodrome are unlikely to adversely affect archaeological sites.
- The proposed action, when compared with the FY00 baseline, involves construction near the existing munitions storage area where archaeological resources are present. As described in Section 4.6, no impacts are expected for any significant archaeological resources.
- Cumulative noise in the Holloman aerodrome is calculated to increase, but no cultural resources in areas inside or outside the base boundaries are expected to have substantively different noise or to be significantly impacted.
- Cumulative effects of the proposed action and approved actions, when compared to the FY95 point of reference, are not projected to result in any additional effects to archaeological resources than those associated with the individual proposed action and approved actions. These effects are not projected to impact any significant cultural resources.

Other Airspace

- Changes in the noise environment from the FY95 point of reference to the FY00 baseline from the Air Force approved mission changes are not expected to adversely affect regional archaeological resources or any specific archaeological resources within the overflown airspace.
- Combination of noise from the proposed action and the FY00 baseline, as well as the cumulative combination of the proposed action and the approved actions from the FY95 point of reference, is not expected to have cumulative impacts on any significant archaeological resources.
- Consultations with Native Americans have not produced adequate information to identify any traditional resource locations within the airspace potentially cumulatively affected.
- Cumulative impacts associated with an NTC are the same as described for the proposed action in Section 4.6.

5.1.6.2 Recently Proposed U.S. Air Force Mission Changes

- Recently proposed U.S. Air Force mission changes, if implemented, would not involve additional construction at Holloman AFB or McGregor Range that would contribute to cumulative impacts with the proposed action.
- No cumulative surface impact from these actions with the proposed action would be expected.
- Noise impacts would be somewhat different in different areas under the airspace, but are neither of the magnitude nor duration to impact any significant archaeological resources.

5.1.6.3 Other Military Activities at WSMR and Fort Bliss

Roving Sands exercises, proposed expansion of ADA sites, and other training activities at McGregor Range could potentially result in impacts on archaeological, cultural, and historical resources.

- Fort Bliss has an extensive ongoing cultural resources management program and anticipates future implementation of an Integrated Cultural Resources Management Plan, developed in consultation with the New Mexico and Texas SHPOs and the Advisory Council on Historic Preservation.
- Various procedures would be implemented to avoid or reduce adverse effects to archaeological, cultural, and historical resources on Fort Bliss. Implementation of the Section 106 process at WSMR would avoid or reduce adverse effects to these resources.
- Procedural measures are in place to reduce, avoid, or mitigate potential environmental impacts to archaeological, cultural, and historical resources from these actions (individually and cumulatively).

5.1.6.4 Nonmilitary Activity

Regional construction involves earth disturbance which could lead to adverse effects on archaeological, cultural, or historical resources.

- State and local measures are designed to reduce, avoid, or mitigate potential environmental impacts to archaeological resources.
- Air Force actions follow Federal and State administered laws to protect such resources.
- The cumulative impacts on these resources from local actions are expected to be minimal.

5.1.7 Water Resources

5.1.7.1 U.S. Air Force Approved Mission Changes

Both the U.S. Air Force approved mission changes at Holloman AFB and the proposed action would involve construction at Holloman AFB. Soil disturbance during construction could affect water resources. The approved mission changes and the proposed action are not expected to result in cumulative impacts to water resources because:

- The construction activities at Holloman AFB involve short-term and temporary disturbances of the soil.
- Runoff from construction sites would be short-term, temporary, and minimized by standard construction practices.
- Earth disturbance from the construction for the approved mission changes and the proposed action would not occur simultaneously.

Other impacts, related to continuing surface disturbance due to munitions expenditures on existing ranges, are considered negligible in themselves, and would not result in a significant cumulative effect in combination with other actions.

5.1.7.2 Recently Proposed U.S. Air Force Mission Changes

The recently proposed U.S. Air Force mission changes, if implemented, would not involve construction in the water resources ROI for the proposed action. Consequently:

- There would be no erosion-related impacts to water resources.
- The proposed force structure changes would not contribute to any cumulative impacts to water resources.

5.1.7.3 Other Military Activities at WSMR and Fort Bliss

The other identified military activities may involve construction or earth-disturbing activities and may affect water resources. Any effect from earth disturbance due to implementation of the proposed action would be short-term and temporary and, in combination with other military activities, would not contribute to a cumulative impact to water resources.

5.1.7.4 Nonmilitary Activity

The identified nonmilitary activities may involve construction activities and may affect water resources. Any effect from construction due to implementation of the proposed action would be short-term and temporary and, in combination with nonmilitary activities, would not contribute to a cumulative impact to water resources.

5.1.8 Hazardous Materials and Hazardous Waste Management

5.1.8.1 U.S. Air Force Approved Mission Changes

Under the U.S. Air Force approved mission changes and the proposed action, changes in hazardous material use and hazardous waste generation would occur at Holloman AFB.

- Hazardous material and waste management requirements at Holloman AFB are primarily driven by the number of personnel and aircraft.
- In FY00, the change in personnel and aircraft under the approved mission changes leads to a change in hazardous material use and waste generation.
- The proposed action would increase personnel and aircraft above the FY00 baseline. This would result in cumulative changes to hazardous material use and waste generation.

These cumulative changes would be effectively handled by the established waste management system at Holloman AFB because:

- Holloman AFB has established hazardous material use practices and hazardous waste generation control that were found to be sufficient to meet the hazardous material and waste management requirements under the proposed action in combination with the FY00 baseline.
- Holloman AFB has an established and successful waste reduction program.

5.1.8.2 Recently Proposed U.S. Air Force Mission Changes

- The recently proposed U.S. Air Force mission changes at Holloman AFB, if implemented, would involve a reduction in personnel and aircraft.
- This reduction, if implemented, would lead to a reduction in hazardous materials and hazardous waste management requirements.
- No adverse cumulative impact to hazardous materials use and hazardous waste generation management would be expected.

5.1.8.3 Other Military Activities at WSMR and Fort Bliss

- Changes in military activities at WSMR and Fort Bliss, in conjunction with the proposed action, other U.S. Air Force approved actions, and recently proposed actions, could cumulatively increase hazardous materials accumulation and hazardous waste generation.

- Air Force and Army procedures for hazardous materials use and hazardous waste management and target cleanup reduce the potential for impact from this source to insignificance.

5.1.8.4 Nonmilitary Activity

No nonmilitary activities, in combination with the proposed action and other recently proposed Air Force actions, would be expected to have a significant cumulative effect on hazardous materials use and hazardous waste management.

5.1.9 Socioeconomics

5.1.9.1 U.S. Air Force Approved Mission Changes

Cumulative impacts to socioeconomic conditions are primarily driven by changes in personnel levels. Between the FY95 reference point and the FY00 baseline, personnel changes occur due to the U.S. Air Force approved mission changes at Holloman AFB. The following evaluates the cumulative effect of these personnel changes on socioeconomic conditions.

- In FY95, personnel at Holloman AFB numbered approximately 5,550.
- Approved actions resulted in FY96 personnel numbers increasing by 350 to 5,900. This increase in personnel was primarily associated with the beddown of the 12 Tornado aircraft.
- The FY00 baseline personnel level at Holloman AFB from all approved actions is projected to be 5,640. This is a reduction of 260 from FY96[1] but is still 90 above the FY95 reference point.
- Implementation of the proposed action would result in personnel levels of 6,280 at Holloman AFB.
- In general, this personnel increase with associated economic activity would represent a net cumulative socioeconomic benefit over conditions prevailing in FY95 or FY96.

5.1.9.2 Recently Proposed U.S. Air Force Mission Changes

- The recently proposed U.S. Air Force mission changes at Holloman AFB, if implemented, would result in a reduction of 449 personnel at Holloman AFB.
- If these mission changes were implemented by FY00, they would result in a personnel level of 5,151.
- Implementation of the proposed expansion of GAF operations at Holloman AFB would bring the cumulative base personnel level to 5,831.

[1] When the analysis of the proposed action was initiated, FY96 personnel data were the most recent available. These data were used where appropriate in the analysis.

- The cumulative effect of the recently proposed mission changes and the proposed expansion of GAF operations would be to return base personnel to fewer than 300 above the FY95 point of reference and approximately to the same level as prevailed in FY96.

Implementation of the recently proposed U.S. Air Force mission changes and the proposed action would result in a small cumulative increase over FY95 and no net cumulative impact to socioeconomic conditions existing in FY96. If the proposed action was selected, positive economic impacts, due to additional construction activities under the proposed expansion of GAF operations, would occur whether or not the recently proposed force structure changes at Holloman AFB were implemented.

5.1.9.3 Other Military Activities at WSMR and Fort Bliss

None of the other identified military activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on socioeconomic conditions in the ROI for the proposed action.

5.1.9.4 Nonmilitary Activity

The projected FY00 baseline used in this EIS captures the anticipated regional projections of population and the economic changes listed in Section 2.3.4. The local economy is expected to be able to provide services needed for the construction personnel and the level of growth that would be associated with these projects.

5.1.10 Transportation

5.1.10.1 U.S. Air Force Approved Mission Changes

Cumulative impacts to transportation are primarily driven by changes in personnel levels. Such changes affect peak hour traffic volume and level of service on the road system.

- Between the FY95 reference point and the FY00 baseline, the changes in personnel described in Section 5.1.9.1 occur due to the U.S. Air Force approved mission changes at Holloman AFB.
- The cumulative effect of these changes will be increased traffic in the community of Alamogordo. Calculated levels of service on Alamogordo roadways reflect planned improvements.

5.1.10.2 Recently Proposed U.S. Air Force Mission Changes

- The cumulative effect of the recently proposed mission changes, if implemented, and the proposed expansion of GAF operations would

be to return base personnel to approximately the same level as prevailed in FY96.

- The cumulative effect of these changes is a reduction in traffic in the community of Alamogordo. This change, however, is not considered to be substantive.

In the absence of other changes in the transportation infrastructure in Alamogordo, traffic conditions would be expected to be similar to those that prevailed in FY95 and FY96. Traffic conditions in Alamogordo are expected to improve over those for the FY95 reference year, as well as for FY96, due to the construction of the Alamogordo Relief Route.

5.1.10.3 Other Military Activities at WSMR and Fort Bliss

Ongoing and continuing activities at WSMR and Fort Bliss, in combination with the proposed action, could lead to increased cumulative soil erosion on McGregor Range. The proposed construction of the NTC would, at most, affect less than five percent of McGregor Range.

5.1.10.4 Nonmilitary Activity

The establishment of the Alamogordo Relief Route west of Alamogordo is expected to relieve traffic congestion on White Sands Boulevard. Since the construction of this bypass is expected to be completed by FY00, its effects on traffic conditions have been included in the analysis of the proposed action.

5.1.11 Utilities

5.1.11.1 U.S. Air Force Approved Mission Changes

Cumulative impacts to utilities are primarily driven by changes in personnel levels. Such changes affect service demand. Between the FY95 reference point and FY00, changes in personnel occur due to the U.S. Air Force approved mission changes at Holloman AFB. Section 5.1.9 summarizes these personnel changes. The cumulative effect of these personnel changes on utilities is described below:

- Implementation of the proposed action plus the FY00 baseline, which includes the approved mission changes, would result in personnel levels of 6,280 at Holloman AFB.
- The cumulative effect of these changes is increased utility requirements at Holloman AFB and in the community of Alamogordo. This change, however, is not considered to be substantive, and no significant cumulative impact to utilities is expected.

5.1.11.2 Recently Proposed U.S. Air Force Mission Changes

- Implementation of these recently proposed mission changes, if implemented, as well as the proposed action, would result in a base personnel level of 5,831 personnel.
- The cumulative effect of the recently proposed mission changes and the proposed expansion of GAF operations would be to return base personnel to approximately the same level as prevailed in FY95/FY96.
- The cumulative effect of these changes is a reduction in utility demand. This change, however, is not considered to be substantive.

5.1.11.3 Other Military Activities at WSMR and Fort Bliss

None of the other identified military activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on utilities in the ROI for the proposed action.

5.1.11.4 Nonmilitary Activity

Municipal and private utilities have developed utility forecasts that are based upon the monitoring of utility consumption, construction activity, and account activity. All known and reasonably foreseeable actions that might affect conditions in the area have been implicitly accounted for in the FY00 baseline.

5.1.12 Soils

5.1.12.1 U.S. Air Force Approved Mission Changes

Cumulative impacts to soils are primarily due to construction activities involving earth disturbance. Both the U.S. Air Force approved mission changes at Holloman AFB and the proposed action involve construction activities at Holloman AFB. Impacts from earth-disturbing activities would be site-specific and would not be expected to result in a significant cumulative effect in conjunction with other actions that have been recently implemented or will be implemented in the reasonably foreseeable future.

5.1.12.2 Recently Proposed U.S. Air Force Mission Changes

The recently proposed U.S. Air Force mission changes, if implemented, would not involve construction in areas affected by construction due to the proposed action, and the erosion-related impacts to soils which would otherwise result. Thus, the recently proposed mission changes, if implemented, would not contribute to any cumulative adverse impacts to soils.

5.1.12.3 Other Military Activities at WSMR and Fort Bliss

None of the other identified military activities involve soil disturbance in the same area as the proposed action. As a result, these activities, in combination with the proposed action and other recently proposed Air Force actions, would have no cumulative effect on soils in the ROI for the proposed action.

5.1.12.4 Nonmilitary Activity

None of the identified nonmilitary activities involve soil disturbance in the same area as the proposed action. No nonmilitary activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on soils in the ROI for the proposed action.

5.1.13 Safety

5.1.13.1 U.S. Air Force Approved Mission Changes

Several ongoing military activities in the ROI for the proposed action have had an influence on the safety environment. These activities reflect a change in the aircraft composition using the regional military training airspace associated with the proposed action.

- The U.S. Air Force approved mission changes, as reflected in the changed aircraft operations between the FY95 point of reference to the FY00 baseline, result in altered use of airspace in the ROI for the proposed action.
- These changes in airspace use result in new statistically predicted Class A mishap times for the FY00 baseline. These changes in statistically projected Class A mishap times are not significant.
- Implementation of the proposed action would further alter airspace use and therefore yield new statistically predicted Class A mishap times. The cumulative effect of both the approved mission changes and the proposed action on the statistically predicted Class A mishap times is not significant.

5.1.13.2 Recently Proposed U.S. Air Force Mission Changes

The cumulative effects associated with the recently proposed U.S. Air Force mission changes, if implemented, would have relatively little net effect on safety in the airspace of the ROI for the proposed expansion of GAF operations at Holloman.

- In most cases, cumulative sorties in any given airspace would decrease.
- This would result in a correlated reduction in mishap risk and bird-aircraft strike risk, thus resulting in a beneficial safety effect.

- Operations would increase on Melrose Range and VR-100/125 primarily due to the force structure changes at Cannon AFB.
- Operations would also increase on IR-178 due to implementation of the RBTI. This latter route is not itself affected by the proposed expansion of GAF operations at Holloman AFB, but overlies portions of IR-102/141, which is affected.
- Based on the best available data for the recently proposed U.S. Air Force mission changes, the changes in use in the affected airspace, either decreasing or increasing, are not sufficient to cause a significant change in safety risks.

5.1.13.3 Other Military Activities at WSMR and Fort Bliss

Other activities are conducted by the U.S. Army and U.S. Air Force on WSMR and by Fort Bliss on McGregor Range. Activities on McGregor Range include missile firings, artillery firing, small arms training, and testing of lasers. For each specific and unique operation, airspace and ground areas exposed to potential risk have been defined. These areas are cleared of all personnel prior to commencement of the operation and access points are guarded during the operation to ensure that no person reenters the area. While the potential for wildlife to be exposed to the effects of high explosives and lasers cannot be totally discounted, the probability of such an occurrence is highly remote. All of these activities are conducted under strict enforcement of range safety processes and procedures, and no levels of unacceptable risk are known to be associated with their conduct. While not a safety impact in and of itself, the need to enforce all required safety processes could lead to preemptive scheduling of restricted airspace, which could affect aircraft operations conducted from Holloman AFB through the training airspace.

None of the other identified military activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on safety in the ROI for the proposed action.

5.1.13.4 Nonmilitary Activity

No nonmilitary activities, in combination with the proposed action and other recently proposed Air Force actions, would have a cumulative effect on safety in the ROI for the proposed action.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The National Environmental Policy Act (NEPA) requires consideration of adverse environmental effects that cannot be avoided should the proposal be implemented; the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitment of resources

which would be involved in the proposal should it be implemented. This section summarizes the findings in Chapter 4.0 that relate to these issues.

5.2.1 Adverse Environmental Effects Which Cannot Be Avoided

Unavoidable environmental effects include impacts from the proposed action that cannot be avoided by modifying the proposal or eliminated through mitigation. Impacts from the proposed beddown of 30 additional GAF Tornados at Holloman AFB that cannot be avoided if the action was implemented include temporary effects from construction, incidental noise from low-altitude overflights, and a small increase in air pollutant emissions from increased vehicle traffic and aircraft operations. Construction-related impacts include temporarily elevated air pollutant emissions associated with construction vehicles and equipment and ground-disturbing activities that generate dust. If one of the NTC training options is implemented, loss of some vegetation and habitat within the impact area would be unavoidable. There is also a potential for unavoidable effects to traditional cultural properties such as Native American sacred sites; consultation with Native American groups is ongoing to determine whether this may be a concern. Increased use of the Red Rio LDT would result in unavoidable loss of two to three acres of vegetation and habitat.

5.2.2 Relationship Between Short-Term Uses Of The Environment And Long-Term Productivity

The proposed action would involve short-term resource uses and environmental effects as well as long-term implications, including beneficial long-term effects. Expansion of facilities and operations at Holloman AFB would occur in areas that have already been committed to development on a long-term basis and, therefore, would not adversely affect long-term productivity.

Use of the NTC, if implemented, would have long-term, but not irreversible, impacts on affected resources. However, vegetation and habitat values could be recovered over the long-term if air-to-ground operations were no longer needed. The reduction in grazing that would occur if the West Otero Mesa training option was selected would be minor and would have no effect on the long-term productivity of ranching operations in the region. The use of either NTC training option would be consistent with the long-term use of McGregor Range for military activities and would not increase the amount of land under military use. Aircraft overflights are not expected to affect the long-term productivity of underlying areas.

The purpose of the proposed action is to enhance the ability of U.S. forces to work effectively with allied forces to maintain national security and global stability. This enables the U.S. to achieve reductions in military forces and associated costs while retaining uniformly high levels of military capability. In

this respect, the proposed action would enhance the long-term stability and productivity of the United States and NATO countries.

5.2.3 Irreversible And Irretrievable Commitment Of Resources

Irreversible and irretrievable commitments of resources are generally related to consumption of nonrenewable resources, such as minerals, or destruction of irreplaceable resources, such as archaeological sites. Construction of facilities at Holloman AFB and the NTC, if implemented, would involve consumption of limited quantities of aggregate, petroleum products, and other construction-related materials. The quantity of these resources used would not significantly affect their availability. Training operations would also involve consumption of nonrenewable resources, such as gasoline used in vehicles, and jet fuel used in aircraft. Use of training ordnance would involve commitment of steel, concrete, and other mineral-based materials. None of these activities would be expected to significantly decrease the availability of minerals or petroleum resources.

There is a potential that construction and use of the NTC, if implemented, could adversely affect archaeological resources and other traditional cultural properties. This could, but is not expected to, result in irretrievable loss of cultural values or information important to understanding of prehistory.

CHAPTER 6.0

REFERENCES

6.0 REFERENCES

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Ronald Williams
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El Paso, TX 79924

The Honorable W. C. "Dub" Williams
State Representative
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Elephant Butte, NM 87935

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Alamogordo, NM 88310

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Lois Ziler
PO Box 67
Dell City, TX 79837

APPENDIX A

MEMORANDUM OF AGREEMENT

Agreement

between

The Department of the Air Force of

the United States of America

and

the Federal Ministry of Defense of the

Federal Republic of Germany

concerning

the Conduct of Operations for German Air Force TORNADOS
in the United States
at Holloman Air Force Base, New Mexico

("Holloman TORNADO Agreement")

The Department of the Air Force of
the United States of America (USAF)

and

The Federal Ministry of Defense of
the Federal Republic of Germany (FMOD),

hereinafter referred to as "the Parties", have agreed as follows:

ARTICLE 1

(1) Subject to reimbursement as required below and in accordance with the United States Arms Export Control Act or successor legislation, the USAF will permit the FMOD beginning in 1995 to train, under its own direction, aircrews sponsored by the German Air Force (GAF) on the TORNADO weapons system at Holloman Air Force Base (AFB), New Mexico, in accordance with this Agreement. It is the intent of both parties to establish a long term relationship for the conduct of GAF TORNADO training beyond the year 2005.

(2) The parties will establish a Holloman TORNADO Steering Committee (TSC) under this Agreement and appoint TSC co-chairmen. The TSC will develop procedures for execution of the TORNADO program. Additional terms and conditions regarding administration, infrastructure, facilities construction, finance, logistics, maintenance, and operations will be included in a Technical Arrangement under this Agreement. The Technical Arrangement will be developed by the TSC and approved by the Parties. In the case of conflict between this Agreement and the Technical Arrangement, this Agreement governs.

ARTICLE 2

(1) Approximately twelve (12) GAF TORNADOs assigned to the GAF Tactical Training Establishment (TTE) will be stationed at Holloman AFB, New Mexico, to conduct TORNADO aircrew training.

(2) The GAF shall have, under the provisions of this Agreement and subject to the approval of the USAF, the right to conduct TORNADO flying operations, maneuvers, and other TORNADO training exercises at Holloman AFB, New Mexico. The 49th Fighter Wing Commander (49FW/CC), shall exercise overall responsibility for flying operations and shall exercise command and control over base and training facilities used by the GAF TTE. The GAF TTE Commander, shall conduct under his own

authority, TORNADO operations in accordance with applicable US law and regulations, including USAF, ACC, and 49FW regulations, directives, and procedures.

To the extent not inconsistent with the foregoing:

(a) TORNADO flying operations at Holloman AFB will be the responsibility of the GAF. GAF aircraft, equipment, and personnel assigned to the TORNADO program at Holloman AFB shall be under the control and command of the GAF TTE Commander. The GAF TTE Commander will coordinate all GAF flying operations, and other GAF TTE activities that may affect operations at Holloman AFB, with the 49FW/CC. The 49FW/CC may delegate this responsibility to the 49th Operations Group Commander (49OG/CC).

(b) The GAF TTE Commander shall exercise command and control over all TORNADO aircraft, sorties, qualification programs, and training activities. The GAF TTE Commander will coordinate with the 49OG/CC all planning and execution aspects of the TORNADO program. The GAF TTE Commander shall ensure that he or his appointed representative attends staff meetings and other meetings concerning flying operations as requested by the 49OG/CC.

(3) The GAF TTE Commander will, to the extent consistent with Federal Aviation Administration (FAA), USAF, ACC, and 49FW regulations, directives, and procedures, conduct training with German instructor aircrews in accordance with standards and provisions applicable to the GAF. Flying operations within the framework of the training program will be carried out in authorized training areas and on flight routes under the conditions prescribed and authorized by appropriate US authorities. Flight operations include sorties on approved Military Training Routes (MTRs), Military Operating Areas (MOAs), and ranges. Key events include tactical very-low-level flights at 100 feet AGL; tactical terrain following flights during the day, at night, and under IMC conditions at 200 feet AGL; use of practice and live munitions including the firing of AIM-9 missiles; EW operations (after the conditions have been created); combined USAF/GAF air operations; and combination(s) of these events**. The GAF will limit EW operations to the use of ESM/ECM equipment as defined in MC-64. TORNADO unique procedures and conditions will be coordinated with the 49OG/CC and, when necessary, will be subject to 49FW/CC approval. The 49FW/CC may delegate this responsibility to the 49OG/CC. The GAF TTE Commander will be familiar with all applicable FAA, USAF, ACC, and 49FW regulations, directives, and procedures and shall ensure GAF military and contractor personnel comply with all applicable provisions. The 49FW will furnish to the GAF TTE all applicable documents.

** Note: The Parties acknowledge that although it is possible to conduct AIM-9 firings in the White Sands Missile Range, the majority of AIM-9 firings are currently conducted at Tyndall AFB ranges via special arrangement. EW training is primarily

conducted at Eglin AFB ranges also via special arrangement; however, HQ ACC is upgrading Melrose range for EW training. EW operations which involve intentional or inadvertent collection and/or analysis of electromagnetic or IR emissions will not be part of the GAF training program.

(4) The GAF will fly approximately 2,500 sorties annually in this training program. Subject to FAA, USAF, ACC, and 49FW regulations, directives, and procedures, and provisions of this Agreement, TORNADO instructor and combat crew training will be in accordance with the designated operational capability (DOC) statement prescribed by the GAF and outlined in the Technical Arrangement. The GAF TTE will have access to airspace, ranges, and low level training routes on an equal basis with USAF squadrons at Holloman AFB. USAF will make its best effort to enable the GAF TTE to use special flying areas.

(5) Training will be organized as follows:

(a) The GAF TTE will have a Training and Logistics Component consisting of the following personnel. Number of personnel are for planning purposes and will be finalized by mutual agreement of the Parties.
- 19 Officers
- 44 Non-commissioned Officer/enlisted personnel
- 8 Civilian personnel

(b) In addition to the above mentioned personnel, approximately another forty (40) TORNADO aircrew personnel will be attached to the GAF TTE in a temporary duty (TDY) status. Crews attending TORNADO continuation training will cycle through on a 30 day (approximately) rotational basis; crews attending TORNADO Fighter Weapons Instructor Course (FWIC) will rotate every six (6) months (approximately).

(c) Supply and maintenance services required for the conduct of training, except for work performed by the GAF itself and services provided by USAF, will be rendered by a contractor of the FMOD employing approximately 140 personnel. These personnel will work exclusively for the GAF in accordance with US law and regulations.

(d) Administrative support of German personnel will be provided by the Federal Republic of Germany Office of Defense Administration U.S.A. and Canada (Branch Office Fort Bliss).

ARTICLE 3

(1) Equipment, systems, material, facilities, and services to be provided by the USAF for technical/logistical requirements of the GAF are listed in the Technical Arrangement.

(2) USAF will arrange, under Foreign Military Sales (FMS) procedures and in accordance with US law, for the construction of infra-structure installations for the GAF in accordance with the Technical Arrangement, should such installations not already exist and be available for GAF use. The GAF will not begin TORNADO operations until, as a minimum, the aircraft hangar, ramp, and sound suppressor equipped engine test facility are completed.

(3) In addition, the USAF will make available the following:

(a) On-base bachelor quarters for German military permanent party and student/TDY personnel under the same rules and procedures applicable to US commissioned and enlisted personnel of comparable rank.

(b) On-base family housing for German military permanent party personnel designated as "key and essential" under the same rules and procedures applicable to US commissioned and enlisted personnel of comparable rank.

(c) Medical and dental care for German Armed Forces personnel and their dependent spouses and children who are authorized to reside with them in the United States in accordance with the Agreement between the Department of Defense of the United States of America and the Federal Minister of Defense of the Federal Republic of Germany concerning Health Care for Members of the Armed Forces and Their Dependents dated 8 April 1992.

(d) Commissary; exchange; morale, welfare, and recreation; and other non-appropriated fund facilities, for German military personnel and their dependent spouses and children who are authorized to reside with their sponsor in the United States.

(e) Morale, welfare, and recreation and other non-appropriated fund facilities for German civilian personnel and German contractor personnel as approved by the 49FW/CC.

ARTICLE 4

(1) The FMOD will pay all costs of German Armed Forces personnel including

salaries, benefits, travel and relocation costs. The FMOD will also ensure that the mortal remains of deceased German Armed Forces and contractor personnel and their dependents are transported to the Federal Republic of Germany at no expense to the Government of the United States of America.

(2) Supplies and services provided to the GAF can be procured by the GAF itself or through the USAF from US DOD stocks or, if requested by the GAF, through procurement from commercial suppliers, using normal Foreign Military Sales (FMS) procedures as stipulated by the Arms Export Control Act, other laws, and regulations of the United States. The GAF is entitled to import from Germany supplies and other goods free of duty to meet its requirements in accordance with NATO SOFA, Article XI, para 4.

(3) Construction work required for the implementation of the training program will be accomplished in accordance with the Arms Export Control Act and laws, regulations and procedures applicable to similar projects for use by US Forces. This will include final auditing by the responsible auditing agency of the US Government. Construction planning and execution will be based on the construction requirement specified by the FMOD, which will be submitted to the US authorities for accomplishment under FMS procedures. Construction planning, execution, and transfer of construction work will be in accordance with the Technical Arrangement.

(4) The FMOD will pay all costs of TORNADO operations and support in accordance with the terms and conditions of an FMS Letter of Offer and Acceptance (LOA), including but not limited to all costs related to the provision of requested facilities, POL, munitions, equipment, systems, publications, material, and services, including range costs. Costs to operate and maintain facilities and provide services that are used jointly will be shared by the Parties in proportion to their usage in accordance with the FMS case and the Technical Arrangement. This includes a proportionate share of base overhead and base operating support.

(5) On or before 1 July of each year, the USAF will forward to the FMOD an LOA specifying the estimated costs for various supplies, services, facilities, and other costs for the next US fiscal year (1 October - 30 September). On or before 1 September of each year, the FMOD will notify the USAF of its acceptance of the LOA for the next US fiscal year or its objections thereto.

(6) Upon acceptance of the LOA, the FMOD will make the payments required thereby in accordance with FMS billing procedures.

(7) The USAF will provide the GAF TTE Commander the information required to certify receipt of services billed to the FMS case. This will be limited to data already available in the USAF for determining case charges. Details regarding this

information will be included in the Technical Arrangement.

(8) No later than one (1) year after the end of each fiscal year USAF will use its best efforts to make final adjustments to and begin closure actions for such case and submit a final bill to the FMOD.

ARTICLE 5

(1) Personnel authorized to fly with the GAF TTE include:

- (a) Instructors and aircrews of the German Air Force and Navy;
- (b) Aircrews of allied NATO nations and German Federal Government Officials as approved by the FMOD;
- (c) Other personnel as approved by FMOD and USAF.

(2) Flights of GAF TORNADO aircraft will be strictly limited to the following purposes:

- (a) Training aircrews;
- (b) Reestablishing the operational status of the aircraft (functional check flights, test flights, and ferry flights);
- (c) Execution of standardization and inspection tasks;
- (d) Required proficiency training flights of those personnel assigned to the program; and
- (e) Familiarization sorties.

ARTICLE 6

(1) The GAF TTE Commander will be a GAF officer in the grade of Colonel and the Senior German National Representative (SGNR) at Holloman AFB. The GAF TTE Commander may address national concerns to the 49FW/CC for resolution.

(2) The GAF TTE Commander shall:

- (a) Be responsible for implementation and quality of the TORNADO training program;

- (b) Be responsible for the discipline and inspection of German military personnel and for internal GAF TTE administration;

- (c) Be responsible for the general welfare and interest of all GAF sponsored personnel (military, civilian, and contractor) and their authorized dependents

at Holloman AFB;

(d) Assist and advise on matters concerning the general welfare and interests of German personnel;

(e) Ensure that all GAF-sponsored personnel adhere to USAF flying regulations and other applicable US law and regulations;

(f) Ensure that GAF-sponsored personnel adhere to USAF and 49FW regulations identified by the 49FW/CC as being applicable to such personnel including regulations governing personnel conduct on base. Failure of such personnel to adhere to applicable US law or regulations may be cause for administrative action, including barring personnel from Holloman AFB;

(g) Ensure that all GAF-sponsored personnel and their dependents adhere to applicable US laws as well as relevant USAF and 49FW regulations. In the event of non-observation, he will initiate appropriate action. Appropriate action may include barring the individual in question from Holloman AFB;

(h) Support the joint Safety Investigation Committee when investigating aircraft accidents and ensure that GAF-sponsored personnel are available for investigations as required by the safety investigation committee when involved in an aircraft accident;

(i) Assign an officer who will participate as an active member in the Accident Board if GAF equipment or GAF-sponsored personnel are involved in an incident or accident;

(j) Be responsible for the receipt of complaints brought forward by GAF-sponsored personnel and the consultation on such complaints;

(k) Ensure the 49FW is notified when GAF-sponsored personnel are hospitalized for a period to exceed seven (7) days, become seriously ill or injured, or die.

ARTICLE 7

(1) Accidents involving only GAF TTE aircraft will be investigated by a Joint Safety Investigation Committee in accordance with the provisions of STANAG 3531 under the responsibility of the GAF.

(2) Accidents involving US Armed Forces and GAF TTE aircraft will be investigated by a joint Safety Investigation Committee in accordance with the provisions of

STANAG 3531 under the responsibility of the US Armed Forces.

(3) The joint Safety Investigation Committee will consist of members of the GAF and US Armed Forces Investigation Groups in accordance with the provisions of STANAG 3531.

(4) The provisions agreed upon in STANAG 3531 regarding the preparation and performance of the investigation will apply.

(5) Reports prepared by the joint Safety Investigation Committee will be submitted to the Director of Flying Safety, Federal Armed Forces, and the flying safety authorities of the US Armed Forces. The principles contained in STANAG 3531 will apply to such reports.

(6) Investigations of security-relevant GAF TTE aircraft incidents (below the accident level) will be accomplished under the responsibility of the GAF TTE Commander in cooperation with the 49FW/CC. The relevant reports will be made available to both parties.

ARTICLE 8

(1) The regular workweek for German personnel will comprise five (5) days, unless training requirements and schedules indicate a need for additional workdays in order to fulfill training objectives. Additional workday requirements must be coordinated through the 49OG/CC.

(2) German holiday regulations will be adapted to observe the appropriate US holidays.

ARTICLE 9

TORNADO aircraft stationed at Holloman AFB will fly with German national emblems/markings.

ARTICLE 10

Engineering, maintenance, servicing, repair, inspection, material management, and logistics support of TORNADO aircraft not provided by the USAF will be the sole responsibility of the GAF. This support will be governed by German national regulations, but must meet the relevant USAF standards. Where necessary and feasible, USAF will support the GAF and/or provide co-utilization of facilities or

services. This support will be listed in the Technical Agreement and implementing FMS case.

ARTICLE 11

Obligations of the two governments during the period of this Agreement will be subject to the availability of appropriated funds and, if required, the enactment of enabling legislation.

ARTICLE 12

In case this Agreement is terminated or expires, the LOA remains in effect in accordance with its terms and conditions. In the event of conflict between the terms and conditions of this Agreement and the terms and conditions of the LOA, the terms and conditions of the LOA will take precedence. Any disagreement regarding the interpretation, application, or implementation of this Agreement not resolved by the SGNR and the 49FW/CC shall be resolved by consultation between the Parties, and shall not be referred to an international tribunal or third party for settlement.

ARTICLE 13

Following termination or cancellation of this Agreement, negotiations shall be conducted between the Parties concerning the residual value, if any, of facilities constructed by the Federal Ministry of Defense at German expense.

ARTICLE 14

(1) This Agreement shall enter into force on the date of the last signature affixed below. This Agreement will remain in effect for ten (10) years unless, after the expiration of five (5) years Holloman AFB ceases to be an operational Air Force flying installation as a result of the operation of US law. After ten (10) years, this Agreement will be automatically extended for successive one-year periods unless either Party notifies the other of its intent to terminate this Agreement giving at least twelve (12) months notice prior to the expiration of this Agreement.

(2) Termination of the LOA shall be in accordance with the terms and conditions of the LOA.

(3) This Agreement may be amended at any time by written agreement of the Parties which shall take the form of an Amendment to this Agreement.

IN WITNESS WHEREOF, the undersigned, being duly authorized, have signed this Agreement.

DONE in two originals in the English and German languages, both texts being equally authentic.

Bonn,	Washington, DC
For the Federal Ministry of Defense of the Federal Republic of Germany	For the Department of the Air Force of the United States
Dated: 30. Mai 1994	Dated: 20 May 94

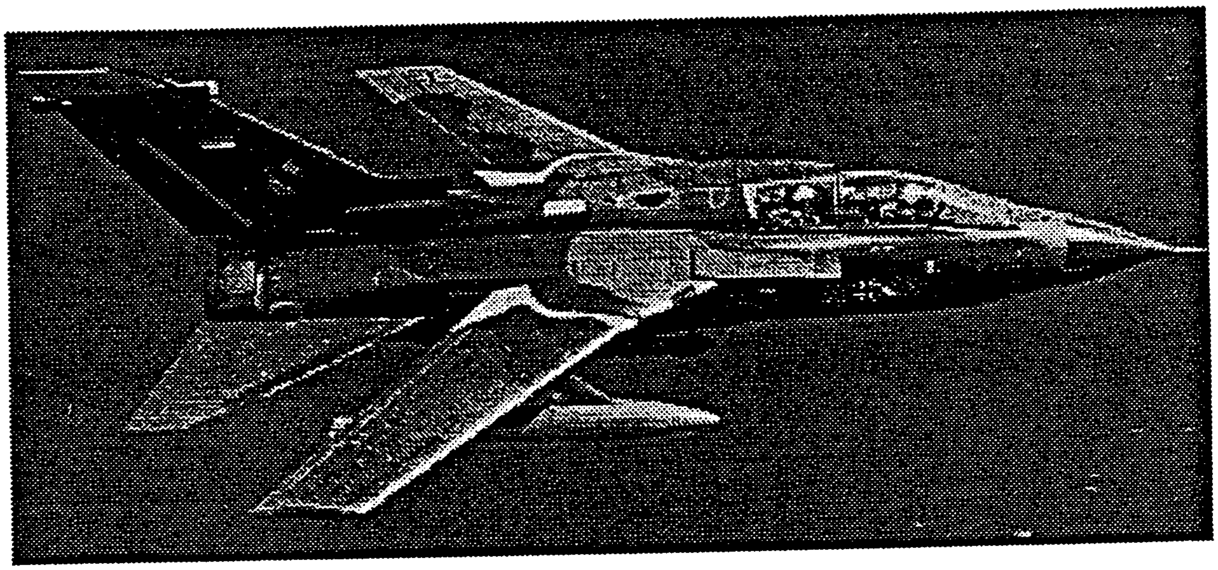
APPENDIX B

HOLLOMAN AFB AIRCRAFT

Fact Sheet

German Air Force   Tactical Training Center USA   1021 Fifth St, Holloman AFB NM 88330

Tornado



German, British and Italian air forces fly the Tornado air-to-ground and air defense fighter. PANAVIA in Munich, Germany, is contracted to all three governments to manufacture and deliver the aircraft. While PANAVIA ensures management and control of the total weapons system program, the production and engineering facilities employed for the development, testing and manufacture of the Tornados are partner companies: Messerschmitt-Bölkow-Blohm, in Germany; Aeritalia, in Italy; and British Aerospace, in Great Britain.

The Tornado Interdictor Strike (IDS) and Air Defense Variant (ADV) use similar airframes and the same engines and aircraft systems, but different radar, avionics software and weapon suites.

Both versions of the Tornado feature two crew positions, two engines, short takeoff and landing performance, fly-by-wire controls, and an aerial refueling probe.

The Tornado IDS attacks targets with high accuracy in all weather conditions. It carries a spectrum of weapons and defensive aids and is highly survivable by virtue of its automatic terrain-following and electronic counter-measure systems.

The Tornado IDS carries two internally mounted guns and two AIM-9 Sidewinder missiles for self defense. The aircraft is guided by an accurate, fully autonomous navigation system.

The Tornado ADV provides autonomous, all-weather air defense. It can patrol for more than two hours at 350 nautical miles from base and can climb to 30,000 feet in under two minutes. The ADV detects targets more than 100 nautical miles away and engages those targets beyond

visual range. It is equipped with a secure data link for integrated tactical scenarios and has a multiple-target track-while-scan radar with high electronic countermeasure resistance. The Tornado ADV features tactical air-to-air displays. It can launch four medium-range Skyflash missiles at four targets in close succession. It carries all-aspect Sidewinder missiles and a 27mm gun for close-in combat.

General Characteristics

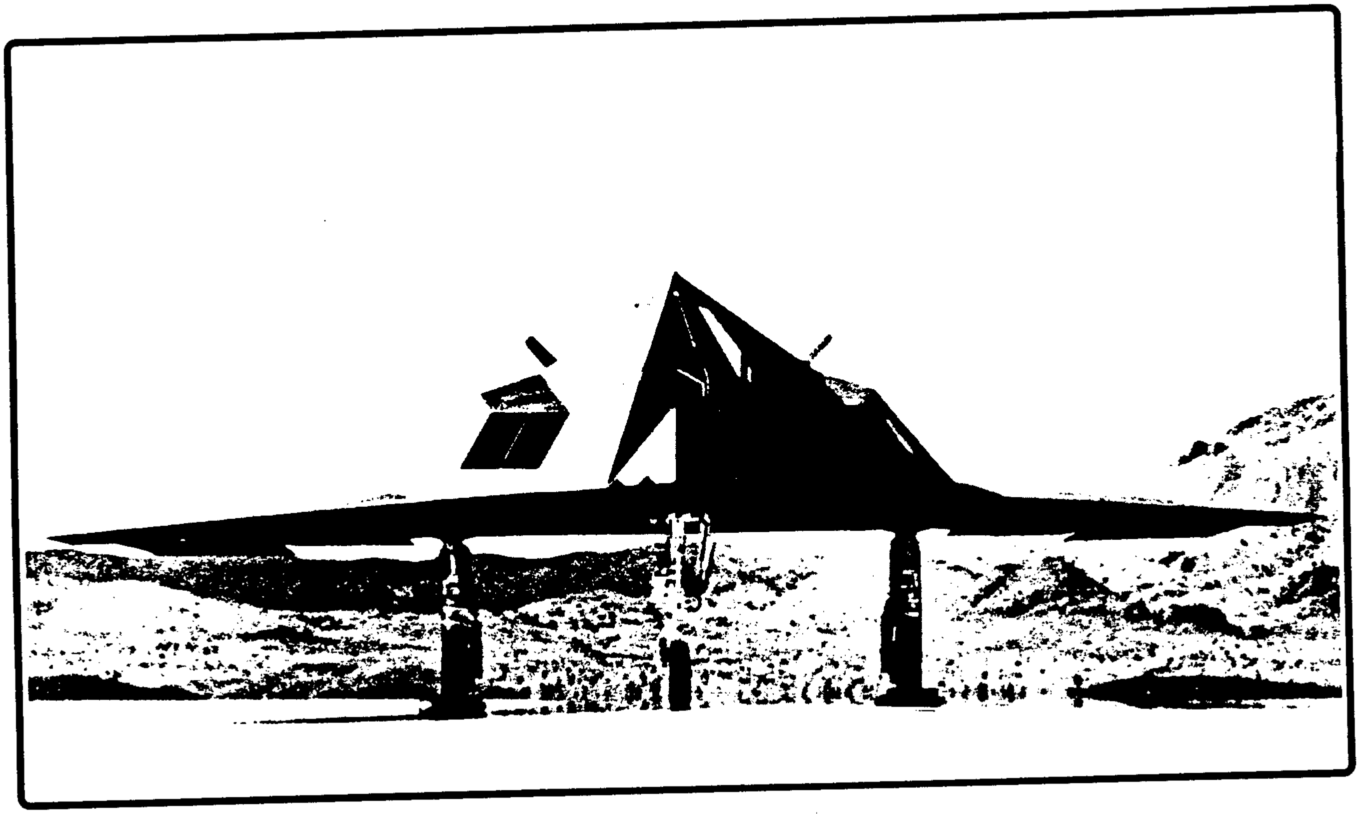
Overall Length: 54 ft, 9 in
Wing Span, Swept: 28 ft, 2 in
Wing Span, unswept: 45 ft, 7 in
Height: 19 ft, 6 in
Maximum Level Speed: Mach 2.2, 800 Knots
Thrust Per Engine: Over 9,000 lb_f
Reheated Thrust Per Engine: Over 16,000 lb_f
Design Fatigue Life: 16,000 hrs
Minimum Service Life: 4,000 hrs
Operational Weight, Empty: 30,800 lb
Max. Take-Off Weight: 61,700 lb
Max. Payload: Over 19,800 lb
Manufacturer: PANAVIA, Munich, Germany

FACT SHEET

93-11

Secretary of the Air Force
Office of Public Affairs
Washington D.C. 20330-1690

F-117A Stealth Fighter



Mission

The F-117A Stealth fighter is the world's first operational aircraft designed to exploit low-observable stealth technology.

Features

The unique design of the single-seat F-117A provides exceptional combat capabilities. About the size of an F-15 Eagle, the twin-engine aircraft is powered by two General Electric F404 turbofan engines and has quadruple redundant fly-by-wire flight controls. Air refuelable, it supports worldwide commitments and adds to the deterrent strength of the U.S. military forces.

The F-117A can employ a variety of weapons and is equipped with sophisticated navigation and attack systems integrated into a state-of-the-art digital avionics suite that increases mission effectiveness and reduces pilot workload. Detailed planning for missions into highly defended target areas is accomplished by an automated mission planning system developed, specifically, to take advantage of the unique capabilities of the F-117A.

Background

The first F-117A was delivered in 1982, and the last delivery was in the fall of 1990. The F-117A production decision was made in 1978 with a contract awarded to Lockheed Advanced Development Projects, the "Skunk

Works," in Burbank, Calif. The first flight was in 1981, only 31 months after the full-scale development decision. Air Combat Command's only F-117A unit, the 4450th Tactical Group, (now the 49th Fighter Wing, Holloman AFB, N.M.), achieved operational capability in October 1983.

Streamlined management by Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, combined breakthrough stealth technology with concurrent development and production to rapidly field the aircraft. The F-117A program has demonstrated that a stealth aircraft can be designed for reliability and maintainability. The aircraft maintenance statistics are comparable to other tactical fighters of similar complexity. Logistically supported by Sacramento Air Logistics Center, McClellan Air Force Base, Calif., the F-117A is kept at the forefront of technology through a planned weapon system improvement program located at USAF Plant 42 at Palmdale, Calif.

General Characteristics

Primary Function: Fighter/attack.
Contractor: Lockheed Aeronautical Systems Co.
Power Plant: Two General Electric F404 engines.
Length: 65 feet, 11 inches (20.3 meters).
Height: 12 feet, 5 inches (3.8 meters).
Weight: 52,500 pounds (23,625 kilograms).
Wingspan: 43 feet, 4 inches (13.3 meters).
Speed: High subsonic.
Range: Unlimited with air refueling.
Armament: Internal weapons carriage.
Unit Cost: $45 million.
Crew: One.
Date Deployed: 1982.
Inventory: Active force, 56; ANG, 0; Reserve, 0.

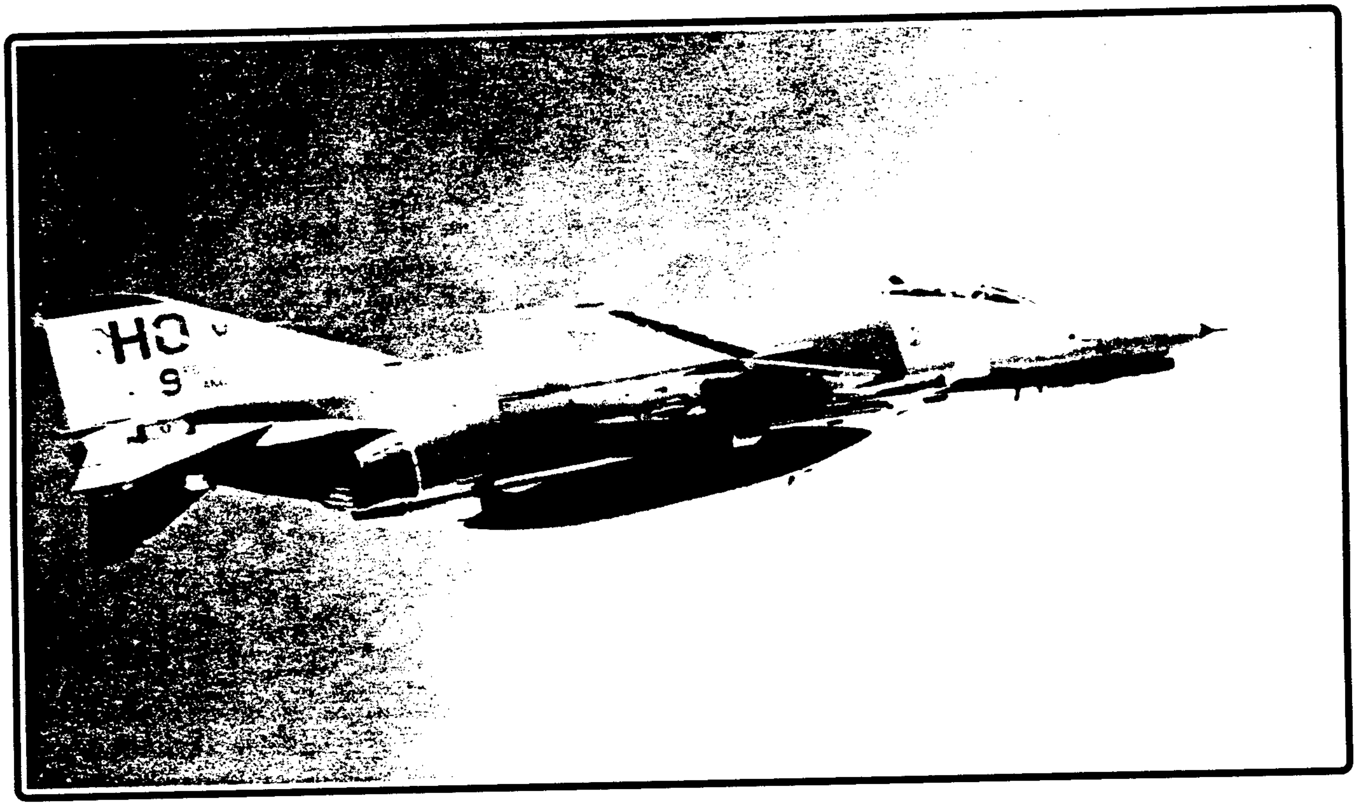
POINT OF CONTACT:
Air Combat Command; Public Affairs Office; 115 Thompson St. Suite 211; Langley AFB, VA 23665-1987; DSN 574-5007, (804) 764-5007.

FACT SHEET

94-01

F-4

Secretary of the Air Force
Office of Public Affairs
Washington D.C. 20330-1690



Mission

The F-4 Phantom II is a twin-engine, all-weather, fighter-bomber. The aircraft can perform three tactical air roles — air superiority, interdiction and close air support — as it did in southeast Asia. With the introduction of newer, more capable weapons systems,. the F-4 mission has narrowed to specializing in the suppression of enemy air defense.

Features

The F-4G "Advanced Wild Weasel," the only model still in the active Air Force inventory, increases the survivability of tactical strike forces by seeking out and suppressing or destroying enemy radar-directed anti-aircraft artillery batteries and surface-to-air missile sites. F-4G's are E models modified with sophisticated electronic warfare equipment in place of the internally mounted 20mm gun. The F-4G can carry more weapons than previous Wild Weasel aircraft and a greater variety of missiles as well as conventional bombs. The primary weapon of the F-4G, however, is the AGM-88 HARM (high speed anti-radiation missile). Other munitions include cluster bombs, and AIM-65 Maverick and air-to-air missiles.

Background

The F-4C first flew for the Air Force in May 1963 and the Air National Guard began flying the F-4C in January 1972. The Air Force Reserve received its first Phantom II in June 1978. The F-4D model, with major changes that increase accuracy in weapons delivery, was delivered to the Air Force in March 1966, to the Air National Guard in 1977, and to the Air Force Reserve in 1980.

The first F-4E was delivered to the Air Force in October 1967. The Air National Guard received its first F-4E in 1985, the Air Force Reserve in 1987. This model, with an additional fuselage fuel tank, leading-edge slats for increased maneuverability, and an improved engine, also has an internally mounted 20mm multibarrel gun with improved fire-control system.

Starting in 1973, F-4E's were fitted with target-identification systems for long-range visual identification of airborne or ground targets. Each system is basically a television camera with a zoom lens to aid in positive identification, and a system called Pave Tack, which provided day and night all-weather capability to acquire, track and designate ground targets for laser, infrared and electro-optically guided weapons. Another change was a digital intercept computer that includes launch computations for all AIM-9 Sidewinder and AIM-7 Sparrow air-to-air missiles. Additionally, on F-4E/G models, the digital ARN-101 navigation system replaced the LN-12 inertial navigation system.

The F-4G "Advanced Wild Weasel," which inherited most of the features of the F-4E, is capable of passing real-time target information to the aircraft's missiles prior to launch. Working in "hunter-killer" teams of two aircraft, such as F-4G and F-16C, the F-4G "hunter" can detect, identify, and locate enemy radars then direct weapons that will ensure destruction or suppression of the radars. The technique was effectively used during Operation Desert Storm against enemy surface-to-air missile batteries. Primary armament includes HARM (AGM-88) and Maverick (AGM-65). F-4G's deployed to Saudi Arabia also were equipped with ALQ-131 and ALQ-184 electronic countermeasures pods.

General Characteristics

Primary Function: All-weather fighter-bomber.
Contractor: McDonnell Aircraft Co., McDonnell Corporation.
Power Plant: Two General Electric turbojet engines with afterburners.
Thrust: 17,900 pounds (8,055 kilograms).
Length: 62 feet, 11 inches (19.1 meters).
Height: 16 feet, 5 inches (5 meters).
Wingspan: 38 feet, 11 inches (11.8 meters).
Speed: More than 1,600 mph (Mach 2).
Ceiling: 60,000 feet (18,182 meters).
Maximum Takeoff Weight: 62,000 pounds (27,900 kilograms).
Range: 1,300 miles (1,130 nautical miles).
Armament: Four AIM-7 Sparrow and four AIM-9M Sidewinder missiles, AGM-65 Maverick missiles, AGM-88 HARM missile capability, and one fuselage centerline bomb rack and four pylon bomb racks capable of carrying 12,500 pounds (5,625 kilograms) of general purpose bombs.
Cost: $18.4 million.
Crew: **F-4G** — Two (pilot and electronic warfare officer).
Date Deployed: May 1963.
Inventory: **F-4G** — Active force, 24; ANG, 24; Reserve, 0.

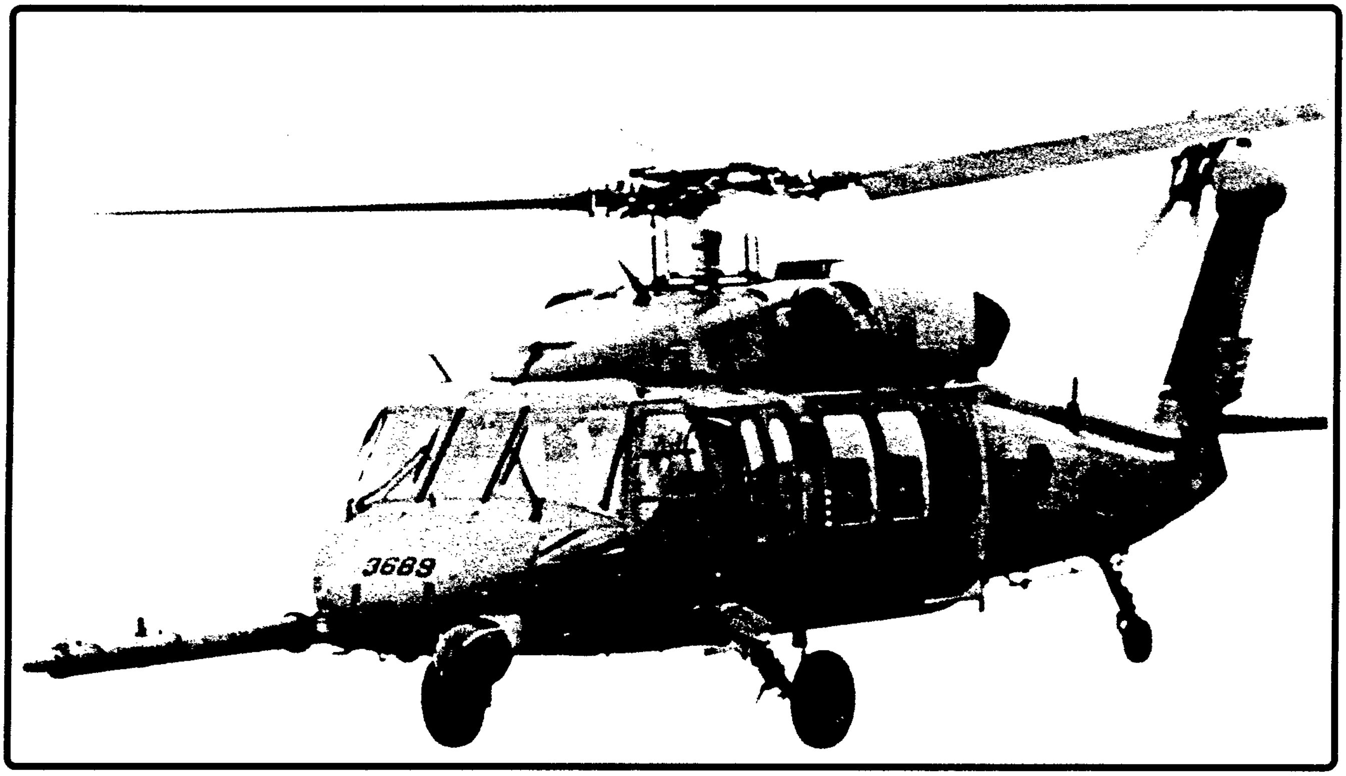
POINT OF CONTACT:
Air Combat Command; Public Affairs Office; 115 Thompson St., Suite 211; Langley AFB, VA 23665-1987; DSN 574-5007, (804) 764-5007.

FACT SHEET

93-08

Secretary of the Air Force
Office of Public Affairs
Washington D.C. 20330-1690

MH-60G Pave Hawk



Mission

The MH-60G's primary wartime missions are infiltration, exfiltration, and resupply of special operations forces in day, night or adverse weather conditions. Other missions include combat recovery.

Features

The MH-60G is equipped with a forward-looking infrared sensor, weather radar and precision navigation systems to better enable the crew to follow terrain contours and avoid obstacles at night or during adverse weather conditions. To extend their range, Pave Hawks are equipped with a retractable in-flight refueling probe and internal auxiliary fuel tanks. Pave Hawks are equipped with a rescue hoist with a 250-foot (75.8 meters) cable and 600-pound (270 kilograms) lift capacity.

All MH-60G's have automatic flight control systems to stabilize the aircraft in typical flight altitudes. They also have instrumentation and engine and rotor blade anti-ice systems for all-weather operation. A non-retractable landing gear consists of two main landing gears and a tail wheel. Aft sliding doors on each side of the troop/cargo compartment allow rapid loading and unloading .

External loads can be carried on an 8,000-pound (3,600 kilograms) capacity cargo hook. Pave Hawks are equipped with folding rotor blades and a tail stabilator for shipboard operations and to ease air transportability.

Equipped with two crew-served 7.62mm mini-guns mounted in the cabin windows, the aircraft can carry two .50 caliber machine guns mounted in the cabin doors. In

addition to the normal armament, other munitions or fuel tanks can be substituted as the mission dictates. Pave Hawk can also carry eight to 10 troops.

Background

The Pave Hawk is a twin-engine medium-lift helicopter operated by the Air Force Special Operations Command, a component of the U.S. Special Operations Command. It is the Air Force's newest addition to its special operations forces.

During Desert Storm, MH-60G's provided combat recovery for coalition air forces in Iraq, Saudi Arabia, Kuwait, Turkey and the Persian Gulf. They also provided emergency evacuation coverage for U.S. Navy sea, air and land (SEAL) teams penetrating the Kuwait coast prior to the invasion.

General Characteristics

Primary Function: Infiltration, exfiltration, and resupply of special operations forces in day, night or adverse weather conditions.
Contractor: Sikorsky Aircraft Corp.
Power Plant: Two General Electric T700-GE-700 or T700-GE-701C engines.
Thrust: 1,560 shaft horsepower, each engine (GE-700) or 1,940 shaft horsepower (GE-701C).
Length: 64 feet, 9.6 inches (19.64 meters).
Height: 16 feet, 9.6 inches (5.09 meters).
Rotary Diameter: 53 feet, 9 inches (16.27 meters).
Speed: 184 mph (294.4 kph).
Maximum Takeoff Weight: 22,000 pounds (9,900 kilograms).
Range: 580 statute miles; 504 nautical miles; unlimited with air refueling.
Armament: Two 7.62mm mini-guns and two .50 caliber machine guns.
Unit Cost: $10.1 million (1992 dollars).
Crew: Two officers (pilots) and two enlisted (flight engineer and gunner).
Date Deployed: 1982.
Inventory: Active force, 10; ANG, 0; Reserve, 6.

POINT OF CONTACT:
Air Force Special Operations Command; Public Affairs Office; 100 Bartley Street; Hurlburt Field, FL 32544-5273; DSN 579-5515, (904) 884-5515.

FACT SHEET

93-18

Secretary of the Air Force
Office of Public Affairs
Washington D.C. 20330-1690

T-38 Talon

Mission

The T-38 Talon is a twin-engine, high-altitude, supersonic jet trainer used in a variety of roles because of its design, economy of operations, ease of maintenance, high performance and exceptional safety record. It is used primarily by Air Education and Training Command for undergraduate pilot and pilot instructor training. Air Combat Command, Air Mobility Command and the National Aeronautics and Space Administration also use the T-38 in various roles.

Features

The T-38 has swept-back wings, a streamlined fuselage and tricycle landing gear with a steerable nose wheel. Two independent hydraulic systems power the ailerons, flaps, rudder and other flight control surfaces.

The instructor and student sit in tandem on rocket-powered ejection seats in a pressurized, air-conditioned cockpit. Critical components are waist high and can be easily reached by maintenance crews. Refueling and preflight inspections are easily performed.

The T-38 needs as little as 2,300 feet (695.2 meters) of runway to take off and can climb from sea level to nearly 30,000 feet (9,068 meters) in one minute.

Background

Student pilots fly the T-38A to learn supersonic techniques, aerobatics, formation, night and instrument flying, and cross-country navigation. More than 60,000 pilots have earned their wings in T-38A aircraft.

Test pilots and flight test engineers are trained in T-38A's at the U.S. Air Force Test Pilot School in Edwards AFB, Calif. Air Force Materiel Command

uses T-38A's to test experimental equipment such as electrical and weapon systems.

Pilots from most North Atlantic Treaty Organization countries are trained in the T-38A at Sheppard Air Force Base, Texas, through the Euro-NATO Joint Jet Pilot Training Program.

The National Aeronautics and Space Administration uses T-38A aircraft as trainers for astronauts and as observers and chase planes on programs such as the space shuttle.

Air Combat Command uses Air Education and Training Command's T-38A's for its Companion Training Program. This program gives younger, less-experienced bomber and tanker co-pilots a chance to develop self-confidence and decision-making skills needed to become aircraft commanders. Air Education and Training Command also uses a modified version, the AT-38B, to prepare pilots and weapon systems officers for fighter aircraft such as the F-4, F-15, F-16, A-10 and F-111. This model carries external armament and weapons delivery equipment for training.

The Talon first flew in 1959. More than 1,100 were delivered to the Air Force between 1961 and 1972 when production ended. Approximately 562 remain in service throughout the Air Force.

An ongoing program called Pacer Classic, the structural life extension program for the T-38, is integrating 10 modifications, including major structural renewal, into one process. As a result, the service life of T-38s should extend to the 2010. Additionally, the introduction of the T-1A Jayhawk Airlift/Tanker Training System will significantly relieve the T-38's work load.

General Characteristics

Primary Function: Advanced jet pilot trainer.
Builder: Northrop Corp.
Power Plant: Two General Electric J85-GE-5 turbojet engines with afterburners.
Thrust: 3,850 pounds (1642.5 kilograms) with afterburners.
Length: 46 feet, 4 1/2 inches (14 meters).
Height: 12 feet, 10 1/2 inches (3.8 meters).
Wingspan: 25 feet, 3 inches (7.6 meters).
Speed: 812 mph (Mach 1.08 at sea level).
Ceiling: Above 55,000 feet (16,667 meters).
Maximum Takeoff Weight: 12,093 pounds (5,200 kilograms).
Range: 1,000 miles (870 nautical miles).
Armament: T-38A: none; AT-38B has provisions for external armament.
Unit Cost: $756,000.
Crew: Two, student and instructor.
Date Deployed: March 1961.
Inventory: Active force, 562; ANG, 0; Reserve 0.

POINT OF CONTACT:

Air Education and Training Command; Public Affairs Office; 100 H Street, Suite 3; Randolph AFB TX 78150-4330; DSN 487-3946, or (210) 652-3946.

Supersedes USAF Fact Sheet 86-21

APPENDIX C

ORDNANCE

APPENDIX C

CHARACTERIZATION OF ORDNANCE PROJECTED FOR USE ON THE RED RIO LDT

The MK (Mark)-82 and MK-84 High and Low Drag General Purpose (LDGP) bombs are essentially the same type of bombs, belonging to the LDGP bomb family. MK munitions are considered "dumb", as they have no guidance once they separate from the aircraft. They differ in size, due to the amount of explosive filler and casing thickness. The basic construction of these bombs consists of an explosive filler (usually Composition B), the steel casing, plumbing (aluminum tubes that channel wires from the bomb rack through the bomb to the fuses), lugs (steel loops on top of the bomb used to hold the bomb to the aircraft bomb ejector rack), a fuse well (indentions on each end of the bomb that hold the explosive boosters and fuses), the fuse itself, and the fins. Fuses are produced separately and are installed on the bomb before use. They are made of metal components that form a channel for an initiating charge and a pyrotechnic train. The initiating charge ignites a pyrotechnic train in the fuse which in turn ignites the booster. The booster (an explosive in an separate, small cylinder between the fuse and explosive filler) ignites the bomb's explosive filler.

The fins are used to stabilize the bomb during its fall. There are three types of bomb stabilization systems: conventional fins, snake-eye (or clamshell) fins, and parachute. Only the clamshell and parachute stabilized bombs would be used under the proposed action. The hazardous materials in an unexploded, assembled bomb are the explosive filler, the pyrotechnic train in each fuse (usually less than 75 grams of tetryl), and the explosive booster (approximately 180 grams of tetryl).

The GBU-10, GBU-12, and GBU-27, laser-guided high-explosive bombs, are all essentially identical with regard to construction. All of these GBUs use similar LDGP bombs for the basic bomb unit, but differ from the Mark class of bombs in the use of a laser guidance system and movable vanes. GBUs are "smart" bombs, since the guidance system can be used to alter the flight tracks after release from an aircraft. These bombs have the same explosive hazards as the MK-82 bomb family. Additional construction characteristics for this family are: laser guidance unit, internal power source, and movable steering vanes.

The laser guidance unit is essentially an electronic eye that homes in on a reflected laser beam. It consists of metal and electronic components. Reflections of a laser beam emitted by the aircraft are picked up by the laser guidance unit, which then sends steering commands to the bomb vanes. The internal power source is a thermal battery used to operate the laser detector and the actuators that move the bomb vanes. Thermal battery constituents are classified, but the material normally weighs two to three pounds. The thermal battery has an initiator that weighs several grams and causes a chemical reaction that produces heat. The heat reaction provides power to actuators connected to the bomb vanes. Bomb vanes change the course of the bomb's direction through the air under commands from the laser guidance system.

The explosive filler in a GBU or MK bomb burns at a very high rate of combustion (over 20,000 feet per second) and thus is called high-explosive. Gases rapidly form from the burn and cause it to expand faster than the speed of sound, creating a pressure sound wave or sonic boom. Gas burn and expansion splits the bomb case into many fragments, consuming the explosive filler and leaving only trace elements of the explosion and combustion byproducts. The majority of these trace elements are dispersed into the air and carried off-site by wind currents. Other smaller amounts of trace residues may collect in the soil.

The explosive filler, called H-6 (or tritonal), is the major hazardous component of any of these bombs. H-6 is composed of 45 percent RDX (C-4 plastic explosive), 30 percent TNT, 20 percent aluminum, 4.5 percent wax, and small amounts of calcium chloride (USAF, n.d.). The combination of RDX and TNT in the 45:30 percent ratio is called Composition B.

Tetryl, contained in the fuses and boosters, is a yellow crystalline (trinitro-2,4,6,-phenylmethylnitramine) explosive commonly used as a detonator. Very little of this material is used in the bomb, and most of that is consumed in the explosive reaction. RDX and tetryl residues in soil would fall under a class of materials called nitramines, which are easily biodegraded and not considered especially toxic.

Of all the bomb materials, only TNT, in a class of materials called nitroaromatics, is considered significantly toxic in high concentrations. However, TNT is almost completely consumed in the explosion of the bomb; in addition, nitroaromatics are highly susceptible to degradation by oxidation, chemical reduction, and biological processes.

The major sources of TNT contamination of soil and groundwater are the manufacture, loading, and demilitarization (disposal) of munitions (EPA, 1993). In fact, the Aberdeen Proving Ground Environmental Center in Maryland (Sisk, 1993) and the U.S. Army Cold Regions Research and Engineering Laboratory in New Hampshire (Jenkins, 1993) are concerned almost entirely with TNT contamination at manufacturing or disposal sites, rather than bombing and practice ranges.

Table C-1. Characteristics for Live Ordnance Used at Red Rio LDT

Weapon Type	Bomb Weight Lbs)	Explosive		Fragmentation Radius (Ft)	Crater Diameter (Ft)
		Type	Weight (Lbs)		
MK 82, MATRA High and Low Drag High Explosive Bomb	500	H-6	192	3345	15
GBU-10	2100	H-6	945	5725	25
MK-84 High and Low Drag High Explosive Bomb	2000	H-6	945	5725	25
GBU-12, Laser Guided High Explosive Bomb	600	H-6	192	3345	15
GBU-27, Laser Guided High Exlposive Bomb	2200	H-6	550	4500	25

Source: United States Air Force
1994

Table C-2. Characteristics of Signal and Spotting Cartridges Used in Conjuntion with Various Munitions

Type	Designator	Explosive primer weight (g)	Expelling Charge Weight (g)	Marker Charge type	Marker Charge Weight
Signal	CXU-3/B	<1	3	titanium tetrachloride (FM smoke)	0.7 ou
	CXU-3A/B	<1	3	titanium tetrachloride (FM smoke)	0.6 ou
	MK 4 Mod 0	<1	3	red phosophorous	10 g
	MK 4 Mod 1 and 2	<1	3	inert*	10 g
	MK 4 Mod 3	<1	3	red phosophorous	10 g
	MK 4 Mod 4	<1	3	zinc oxide	10 g
Spotting	CXU-1/B	<1	1	titanium tetrachloride (FM smoke)	43 g
	CXU-2/B	<1	4	titanium tetrachloride (FM smoke)	43 g
	CXU-4/B and CXU-4/A/B	<1	?	titanium tetrachloride (FM smoke)	1.9 ou

*** Composition unknown**

APPENDIX D

NOISE

APPENDIX D

Aircraft Noise Analysis

D.1 NOISE

D.1.1 General

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

Sound is a physical phenomenon consisting of minute vibrations which travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (for example, music) or unpleasant (for example, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The measurement and human perception of sound involves two basic physical characteristics - intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.

The loudest sounds which can be detected comfortably by the human ear have intensities which are 1,000,000,000,000 times larger than those of sounds which can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level.

A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

$$60 \text{ dB} + 60 \text{ dB} = 63 \text{ dB, and}$$
$$80 \text{ dB} + 80 \text{ dB} = 83 \text{ dB.}$$

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

$$60.0 \text{ dB} + 70.0 \text{ dB} = 70.4 \text{ dB.}$$

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition". The latter term arises from the fact that what we are really doing when we add decibel values is first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

An important facet of decibel addition arises later when the concept of time-average sound levels is introduced to explain Day-Night Average Sound Level. Because of the logarithmic units, the time-average sound level is dominated by the louder levels which occur during the averaging period. As a simple example, consider a sound level which is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB which also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

The minimum change in the time-average sound level of individual events which an average human ear can detect is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound <u>intensity</u> but only a 50 percent decrease in perceived <u>loudness</u> because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the preferred scientific unit for cps. The normal human ear can detect sounds which range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally well by the human ear, which is most sensitive to frequencies in the 1000 to 4000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's

lower sensitivity to those frequencies. This is called "A-weighting" and is commonly used in measurements of community environmental noise.

Sound levels measured using A-weighting are most properly called A-weighted sound levels while sound levels measured without any frequency weighting are most properly called sound levels. However, since most environmental impact analysis documents deal only with A-weighted sound levels, the adjective "A-weighted" is often omitted, and A-weighted sound levels are referred to simply as sound levels. In some instances, the author will indicate that the levels have been A-weighted by using the abbreviation dBA or dB(A), rather than the abbreviation dB, for decibel. As long as the use of A-weighting is understood to be used, there is no difference implied by the terms "sound level" and "A-weighted sound level" or by the units dB, dBA, and dB(A). In this document, all levels are A-weighted and are reported in dB, unless otherwise indicated.

Sound levels do not represent instantaneous measurements but rather averages over short periods of time. Two measurement time periods are most common - one second and one-eighth of a second. A measured sound level averaged over one second is called a slow response sound level; one averaged over one-eighth of a second is called a fast response sound level. Most environmental noise studies use slow response measurements, and the adjective "slow response" is usually omitted. It is easy to understand why the proper descriptor "slow response A-weighted sound level" is usually shortened to "sound level" in environmental impact analysis documents.

D.1.2 Noise Metrics

A "metric" is defined as something "of, involving, or used in measurement." As used in environmental noise analyses, a metric refers to the unit or quantity which quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise or environmental noise abatement has included many different metrics. Recently, however, various federal agencies involved in environmental noise mitigation have agreed on common metrics for environmental impact analysis documents, and both the Department of Defense and the Federal Aviation Administration have specified those which should be used for federal aviation noise assessments. These metrics are as follows.

D.1.2.1 Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is

usually abbreviated by ALM, L_{max} or L_{Amax}. The maximum sound levels of typical events are shown in Figure D-1. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities.

D.1.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics - a sound level which changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE}) combines both of these characteristics into a single metric.

Sound Exposure Level is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since aircraft overflights usually last longer than one second, the Sound Exposure Level of an overflight is usually greater than the maximum sound level of the overflight.

Sound exposure level is a composite metric which represents both the intensity of a sound and its duration. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that Sound Exposure Level measures this impact much more reliably than just the maximum sound level.

Because the sound exposure level and the maximum sound level are both A-weighted sound levels expressed in decibels, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

D.1.2.3 Day-Night Average Sound Level

Time-average sound levels are the measurements of sound levels which are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, and particularly aircraft noise effects, the Day-Night Average Sound Level (abbreviated DNL or L_{dn}) is used. Day-Night Average Sound Level averages aircraft sound levels at a location over a complete 24-hour period, with a 10-decibel adjustment added to those noise events which take place between 10:00 p.m. and 7:00 a.m. (local time) the following morning. This 10-decibel "penalty" represents the added intrusiveness of sounds

Noise Source (at a given distance)	A-Weighted Sound Level Scale (dBA)	Noise Environment	Human Judgement of Noise Loudness[(1)]
Civil Defense Siren (100 ft)	130	Carrier Flight Deck	
	120		Threshold of Pain
Pile Driver (50 ft)	110	Rock Music Concert	32 Times as Loud
PA-200 Tornado (500 ft)	108		16 Times as Loud
F-16 (500 ft)	104		
			Very Loud
Ambulance Siren (100 ft)	100		
Newspaper Press (5 ft)			8 Times as Loud
Power Lawn Mower (3 ft)			
T-38 (500 ft)	93		
Motorcycle (25 ft)	90	Boiler Room	4 Times as Loud
Prop Plane Flyover (1,000 ft)		Printing Press Plant	
Diesel Truck, 40 mph (50 ft)			
Garbage Disposal (3 ft)	80	High Urban Ambient Sound	2 Times as Loud
			Moderately Loud
Passenger Car, 65 mph (25 ft)			
Living Room Stereo (15 ft)	70		
Vacuum Cleaner (3 ft)			
Electronic Typewriter (10 ft)			
Normal Conversation (5 ft)	60	Data Processing Center	1/2 as Loud
Air Conditioning Unit (100 ft)		Department Store	
Light Traffic (100 ft)	50	Private Business Office	1/4 as Loud
Bird Calls (Distant)	40	Lower Limit of Urban Ambient Sound	Quiet 1/8 as Loud
Soft Whisper (5 ft)	30	Quiet Bedroom	
	20	Recording Studio	Just Audible Threshold of Hearing
	10		
	0		

Note: (1) Relative to a reference loudness of 70 dBA

Figure D-1. Typical A-Weighted Sound Levels of Common Sounds

which occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

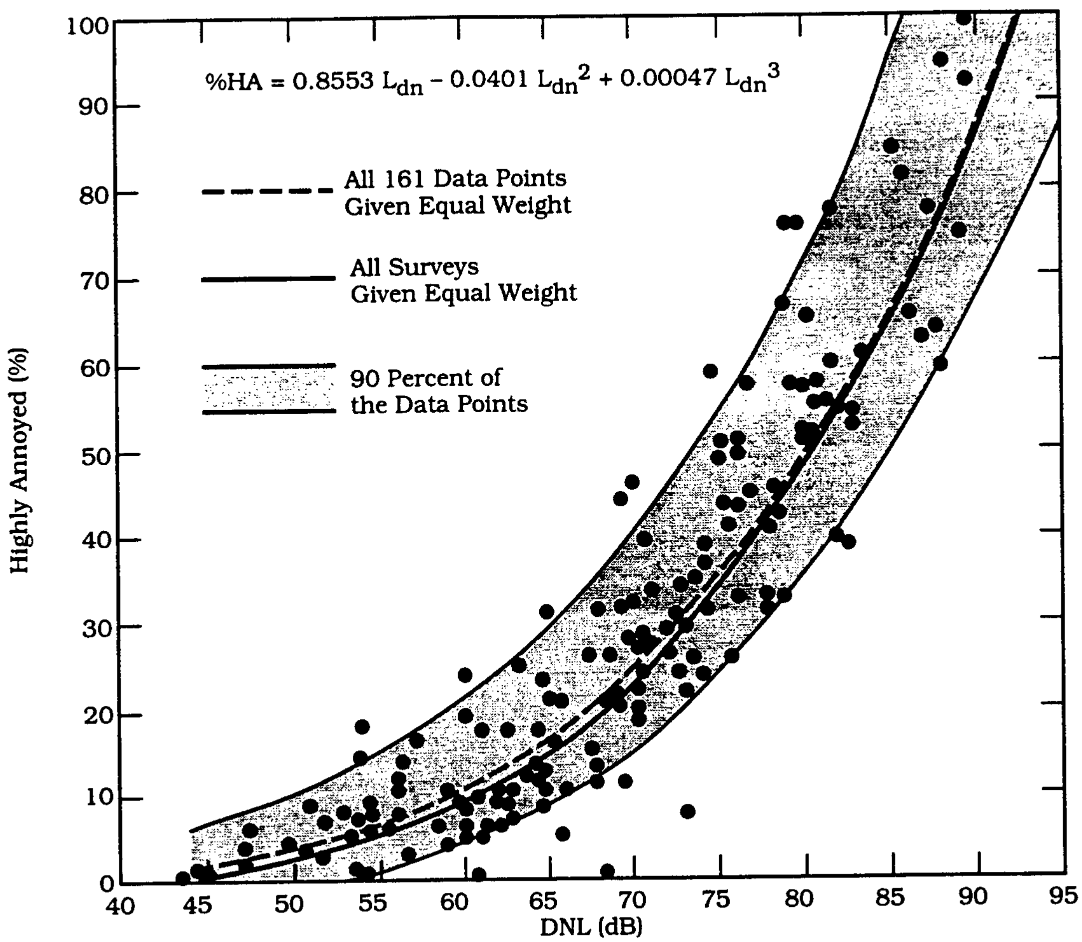
Ignoring the 10-decibel nighttime adjustment for the moment, Day-Night Average Sound Level may be thought of as the continuous A-weighted Sound Level which would be present if all of the variations in sound level which occur over a 24-hour period were smoothed out so as to contain the same total sound energy.

Day-Night Average Sound Level provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels which occur during the day. For example, a Day-Night Average Sound Level of 65 dB could result from a very few noisy events, or a large number of quieter events.

As noted earlier for Sound Exposure Level, Day-Night Average Sound Level does not represent the sound level heard at any particular time, but rather represents the total sound exposure. Scientific studies and social surveys which have been conducted to appraise community annoyance to all types of environmental noise have found the Day-Night Average Sound Level to be the best measure of that annoyance. Its use is endorsed by the scientific community (ANSI, 1980; ANSI, 1988; USEPA, 1972a; FICUN 1980; FICON, 1992).

There is, in fact, a remarkable consistency in the results of attitudinal surveys about aircraft noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of Day-Night Average Sound Level. This is illustrated in Figure D-2, which summarizes the results of a large number of social surveys relating community responses to various types of noises, measured in Day-Night Average Sound Level.

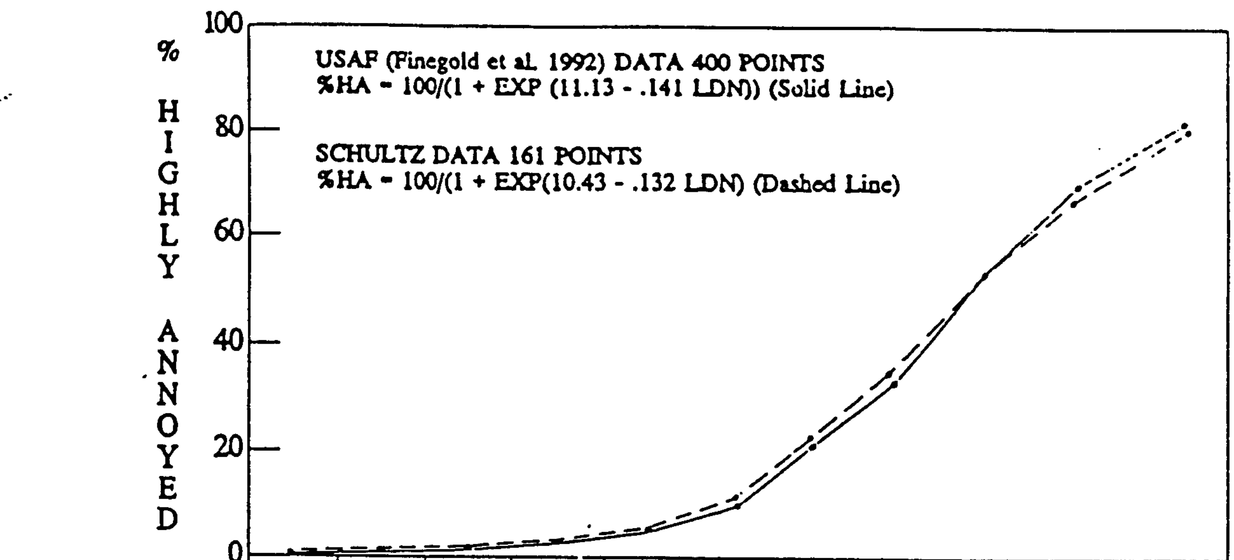
Figure D-2 was taken from a 1978 publication (Schultz 1978), and shows the original curve fit. A more recent study has reaffirmed this relationship (Fidell *et al.*, 1991). Figure D-3 (FICON, 1992) shows an updated form of the curve fit (Finegold *et al.* , 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors which influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using Day-Night Average Sound Level.



Source: Schultz, 1978.

Figure D-2. Community Surveys of Noise Annoyance

Figure D-3. Response of Communities to Noise; Comparison of Original (Schultz, 1978) and Current (Finegold et al., 1994) Curve Fits



	Day - Night Average Sound Level in dB	40	45	50	55	60	65	70	75	80	85	90
Calculated %HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

This relation between community annoyance and time-average sound level has been confirmed, even for infrequent aircraft noise events. A NASA study (Fields and Powell, 1985) reported the reactions of individuals in a community to daily helicopter overflights, ranging from one to 32 per day. The stated reactions to infrequent helicopter overflights correlated quite well with the daily time-average sound levels over this range of numbers of daily noise events.

The use of Day-Night Average Sound Level has been criticized recently as not accurately representing community annoyance and land-use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of L_{dn}. One frequent criticism is based on the inherent feeling that people react more to single noise events and not as much to "meaningless" time-average sound levels.

In fact, a time-average noise metric, such as L_{dn}, takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The Day-Night Average Sound Level for this 24-hour period is 65.5 dB. Assume, as a second example, that ten such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The Day-Night Average Sound Level for this 24-hour period is 75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the Day-Night Average Sound Level.

D.1.2.4 Onset-Rate Adjusted Day-Night Average Sound Level

Aircraft operations along low-altitude Military Training Routes (MTRs) generate a noise environment somewhat different from other community noise environments. Overflights are highly sporadic, ranging from five or ten per day to less than five per week. This situation differs from most community noise environments, in which noise tends to be continuous or patterned. Individual military overflight events also differ from typical community noise events, because of the low-altitude and high-airspeed characteristics of military aircraft operating on Military Training Routes.

Table D-1. Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (L_{dn}) in decibels*					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO TABLE D-1

SLUCM = Standard Land-Use Coding Manual.
Y (Yes) = Land Use and related structures compatible without restrictions.
N (No) = Land Use and related structures are not compatible and should be prohibited.
NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

NOTES FOR TABLE D-1

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal level is low.
(5) Land-use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

To represent these differences, the conventional Day-Night Average Sound Level metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin *et al.*, 1991; Stusnick *et al.* , 1992; Stusnick *et al.*, 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 30 dB per second, an adjustment or penalty ranging from 0 to 5 dB is added to the normal Sound Exposure Level. Onset rates above 30 dB per second require a 5 dB penalty, while onset rates below 15 dB per second require no adjustment. The Day-Night Average Sound Level is then determined in the same manner as for conventional aircraft noise events and is designated as Onset-Rate Adjusted Day Night Average Sound Level (abbreviated L_{dnr}). Because of the sporadic occurrences of aircraft overflights along Military Training Routes, the number of average daily operations is determined by using the calendar month with the highest number of operations along the Military Training Route. The monthly average is denoted L_{dnmr}.

D.1.3 Land-Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the Day-Night Average Sound Level or Onset-Rate Adjusted Day-Night Average Sound Level for military overflights.

In June 1980, an *ad hoc* Federal Interagency Committee on Urban Noise published guidelines (FICUN, 1980) relating Day-Night Average Sound Levels to compatible land uses. This committee was composed of representatives from the United States Departments of Defense, Transportation, and Housing and Urban Development; the Environmental Protection Agency; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, the Department of Defense and the Federal Aviation Administration (FAA) adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (USDOT, 1984). These guidelines are reprinted in Table D-1, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor Day-Night Average Sound Levels (L_{dn} values) above 65 dB, and the extent of land areas and populations exposed to L_{dn} of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions.

In 1990 a new Federal Interagency Committee on Noise was formed to review the manner in which aviation noise effects are assessed and presented. This group released its report in 1992 and reaffirmed the use of Day-Night Average Sound Level as the best metric for this purpose (FICON, 1992).

Analyses of aircraft noise impacts and compatible land uses around Department of Defense facilities and airspaces are normally made using NOISEMAP (Moulton, 1992) and/or ROUTEMAP (Lucas and Plotkin, 1988). These computer-based simulation programs calculate Day-Night Average Sound Levels at many points on the ground around an airfield or military operating area and draw contours of equal level for overlay onto land-use maps of the same scale. Each program mathematically calculates the Sound Exposure Levels of all aircraft operations for a 24-hour period, taking into consideration the number and types of aircraft, their flight paths and engine thrust settings, the time of day (daytime or nighttime) that each operation occurs, and the onset rate, as appropriate. NOISEMAP and ROUTEMAP utilize the same physical models and aircraft performance data and are collectively referred to as "NOISEMAP technology" or simply "NOISEMAP".

Day-Night Average Sound Levels may also be measured directly around an airfield, rather than calculated with NOISEMAP; however, the direct measurement of annualized Day-Night Average Sound Level is difficult and costly since it requires year-round monitoring or careful seasonal sampling.

NOISEMAP provides an accurate projection of aircraft noise around airfields. NOISEMAP also has the flexibility of calculating sound levels at any specified ground location so that noise levels at representative points under flight paths can be ascertained. NOISEMAP is most accurate for comparing "before and after" noise impacts which would result from proposed airfield changes or alternative noise control actions, so long as the various impacts are calculated in a consistent manner.

D.2 NOISE EFFECTS

D.2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal (Occupational Safety and Health Administration - OSHA) workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Air Force occupational noise exposure standards are more strict, allowing for a maximum of 85 dB over an 8-hour work period (AFOSH Standard 48-19). Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period (USEPA, 1972a). Since it is unlikely that airport

neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a Day-Night Average Sound Level of 75 dB, and this level is extremely conservative.

D.2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have never been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on 22–24 January 1990 in Washington, D.C., which states the following "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day). At the recent (1988) International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place." (von Gierke, 1990; parenthetical wording added for clarification.)

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two UCLA researchers apparently found a relation between aircraft noise levels under the approach path to Los Angeles International Airport (LAX) and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw, 1979). Nevertheless, three other UCLA professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs *et al.* 1980).

As a second example, two other UCLA researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the

period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher, 1978). Based on this report, a separate group at the U.S. Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds, 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (CHCN, 1996) reviewed currently available published information on this topic. They concluded that the threshold for possible long-term health effects was a 16-hour (0600 to 2200) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalth used with L_{dn}, this corresponds to L_{dn} of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

D.2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the U.S. Environmental Protection Agency as any negative subjective reaction on the part of an individual or group (USEPA, 1972a). As noted in the discussion of Day-Night Average Sound Level above, community annoyance is best measured by that metric.

Because the EPA Levels Document (USEPA, 1972a) identified L_{dn} of 55 dB as "...requisite to protect public health and welfare with an adequate margin of safety", it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified L_{dn} of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (FICON, 1992). This corresponds to about 13 percent of the exposed population being highly annoyed.

Although L_{dn} of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit and it is appropriate to consider other thresholds in particular cases. In this EIS, no specific threshold is used. The noise in each affected area is evaluated on the basis of the information presented in this appendix and in the body of the EIS. Particular attention is given to the ideal 55 dB identified by EPA.

D.2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the Sound Exposure Level metric will measure speech interference successfully, and that a Sound Exposure Level exceeding 65 dB will begin to interfere with speech communication.

D.2.5 Sleep Interference

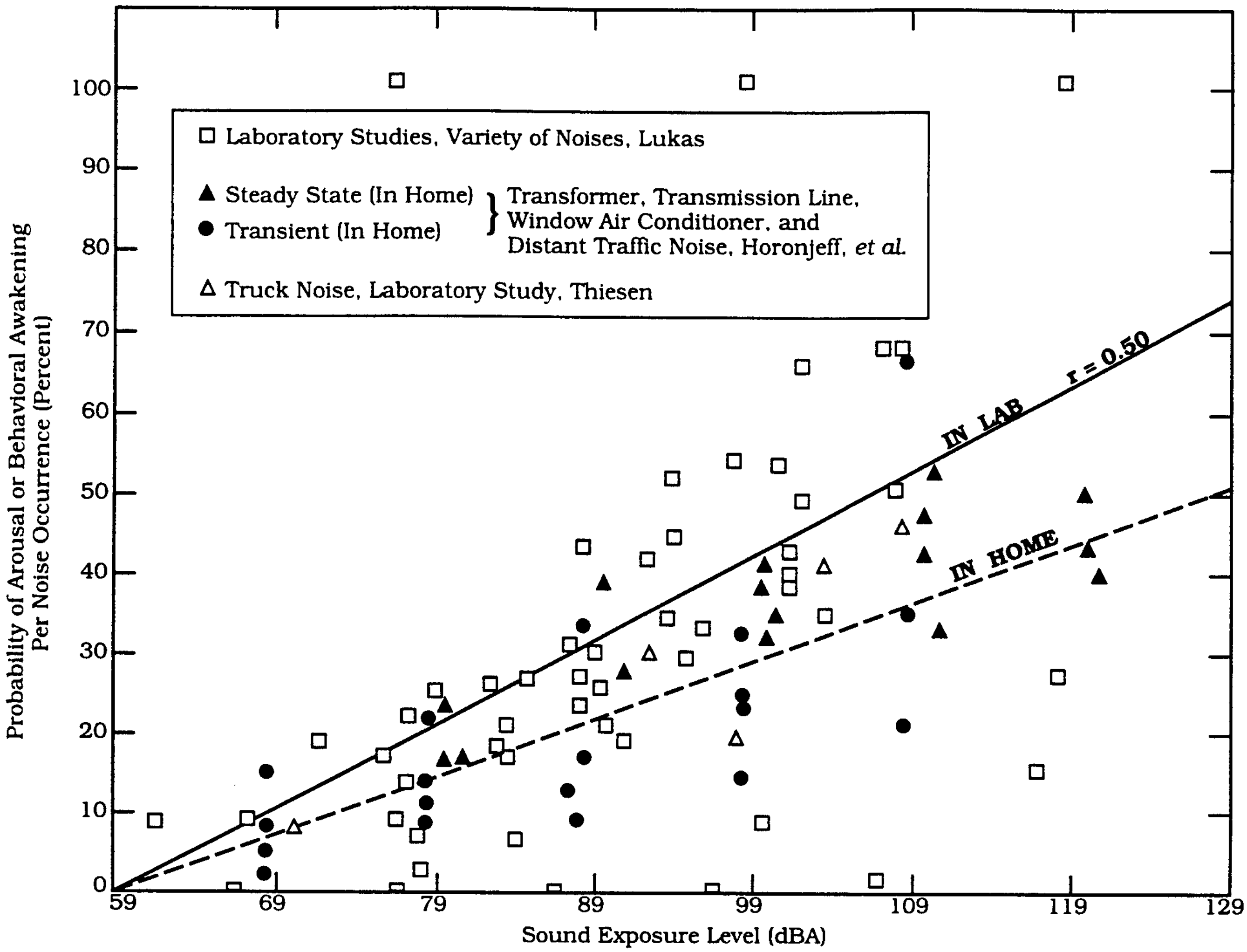
Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

A recent analysis sponsored by the U.S. Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons *et al.* , 1989). The analysis concluded that a lack of reliable studies in homes, combined with large differences among the results from the various laboratory studies and the limited in-home studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced in the home. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions.

Nevertheless, some guidance is available in judging sleep interference. The U.S. Environmental Protection Agency identified an indoor Day-Night Average Sound Level of 45 dB as necessary to protect against sleep interference (USEPA, 1972a). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor Day-Night Average Sound Level of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of Sound Exposure Level (Kryter, 1984). Figure D-4, extracted from



Source: Kryter, 1984.

Figure D-4. Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

Figure 10.37 of Kryter (1984), indicates that an <u>indoor</u> Sound Exposure Level of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

D.2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans – stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

There are available many scientific studies regarding the effects of noise on wildlife and some anecdotal reports of wildlife "flight" due to noise. Few of these studies or reports include any reliable measures of the actual noise levels involved. However, in the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council has proposed that protective noise criteria for animals be taken to be the same as for humans (NRC NAS, 1977).

D.2.7 Noise Effects on Structures

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonances. While certain frequencies (such as 30 hertz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (NRC NAS, 1977).

A recent study, directed specifically at low-altitude, high-speed aircraft on Military Training Routes, showed that there is little probability of structural damage from such operations (Sutherland, 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle", of objects within

the dwelling - hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear of breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

D.2.8 Noise Effects on Terrain

Members of the public often perceive that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

D.2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport (IAD). These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler, 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

D.3 REFERENCES

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APPENDIX E

LAND USE

Appendix E-1. Demographic Information for Counties Underlying Existing MTRs Used by Holloman Units

County	Associated MTRs	County population[1]	County Area (sq miles)	County Density (total av/rural av)[2]
TEXAS				
Brewster	IR-178, VR-196, IR-102/141	9,740	6,193	1/<1
Culberson	IR-178, 192/194, IR-102/141	3,690	3,813	1/<1
Hudspeth	IR-102/141, 192/194	3,130	4,571	1/<1
Jeff Davis	IR-102/141	2,000	2,265	1/<1
Pecos	IR-178, IR-102/141	17,100	4,764	3/1
Presido	IR-178, IR-102/141	7,340	3,856	2/<1
Reeves	IR-178, IR-102/141	17,000	2,636	6/1
NEW MEXICO				
Catron	VR-176	2,501	6,928	>1/>1
Chaves	IR-113, 102/141, 134/195, 192/194, VR-125	60,401	6,071	10/2
Cibola	VR-176	23,794	4,540	5/2
Curry	VR-125	48,967	1,406	30/4
De Baca	VR-125, IR-113	2,373	2,325	1/>1
Dona Ana	VR-176	135,510	3,807	36/12
Eddy	IR-134/195, 102/141, 192/194	49,866	4,182	12/3
Grant	VR-125	28,470	3,966	7/2
Guadalupe	IR-113, 133, VR-125	4,051	3,031	1/<1
Lincoln	IR-113, 133, VR-125, 176	13,445	4,831	3/<1
Luna	VR-176	19,851	2,965	7/2
Otero	IR-102/141, 134/195, 192/194, VR-176	54,790	6,627	8/2
Quay	VR-125, IR-113	10,800	2,875	4/1
Roosevelt	IR-113, VR-125	17,962	2,449	7/2
Sierra	VR-176	10,559	4,180	2/1
Socorro	IR-113, 133, VR-125, 176	15,355	6,647	2/<1
Torrance	IR-113, 133, VR-125, 176	12,169	3,345	3/2
ARIZONA				
Apache	VR-176	61,591	11,206	6/5
Greenlee	VR-176	8,008	1,847	4/2

Sources: Texas Controllers Office; Bureau of Business and Economic Research, University of New Mexico; US Census 1990.

Notes:

1. 1995 projections.
2. Total average density is total population averaged over total area. Rural average density is total population minus population of places, towns, and cities, averaged over total area. Density is presented in persons per square mile.

Appendix E-2. Land Uses Under MOAs, by County

Airspace	County	Towns/Communities	Special Uses
Talon High	Chaves, Eddy, Otero	Carlsbad, Artesia, Lakewood, Seven Rivers, Hope,Queen	Lincoln National Forest, Sitting Bull Falls Recreation Area, South Texas Hill Canyon RNA, Brokeoff Mountains WSA, Brantley Lake SP, Living Desert Zoological SP
Talon Low	Chaves, Eddy, Otero		Lincoln National Forest, South Texas Hill Canyon RNA, Brokeoff Mountains WSA, Sitting Bull Falls Recreation Area
Pecos	De Baca, Chaves, Guadalupe, Lincoln	Buchanan, Joffre, Evanola, Ricardo, La Lande, Yeso, Fort Sumner, Mesa	Roswell Cave Complex ACEC
Beak	Lincoln, Otero	Tecolote, Luna, Jicarilla, White Oaks, Encinoso, Arabela, Capitan, Nogal, Glencoe, Ruidoso, Stanton, Lincoln, Picacho, Riverside, San Patricio	Lincoln National Forest, Capitan Mountains Wilderness, White Mountain Wilderness, Mescalero Apache Indian Reservation

Sources: Texas Atlas and Gazetteer, AAA Road Atlas, USGS topographic map series, New Mexico

Wilderness Status Map, Sectional Navigation charts, the Roads of New Mexico.

Appendix E-3. Land Use Information Underlying MTRs Used by Holloman Units

Route	*Counties*	*Towns, Communities*	*Primary Land Uses*	*Land Owners/ Managers*	*Special Uses*
IR-113	Chaves, De Baca, Guadalupe, Lincoln, Quay, Roosevelt, Socorro, Torrance	Yeso, Pedernal, Willard, Claunch, Ancho, White Oaks, Encinoso, Pine Lodge	Livestock grazing, recreation	State, BLM, USFS, private	Cibola NF, Lincoln NF, Sumner Lake SP, Capitan Mountains WA
IR-133	Socorro, Torrance, Lincoln, Guadalupe	Bingham, Mountainair, Encino, Willard, Vaughn, Arabela, San Patricio, Hondo, Pine Lodge, Danmoor, Duran, Pedernel, Negra, Bluewater	Livestock grazing, recreation and hunting, forestry	State, BLM, USFS, NPS, private	Salinas Pueblo Mission National Monument (Gran Quivira, Abo, and Quarai units), Lincoln NF, Capitan Mountains WA, Cibola NF, Little Black Peak WSA, Carrizozo Lava Flows WSA, Valley of Fires RA
IR-134/195	Otero, Chaves, Eddy	Elk, Dunken, Piñon, Avis, Weed	Livestock grazing, recreation and hunting, forestry, oil and gas exploration and extraction	State, BLM, DOD, USFS, private	Lincoln NF and Guadalupe Escarpment, McKittrick, Lonesome Ridge, Devils Den Canyon, and Brokeoff Mountains WSAs, Alkali Lakes Proposed ACEC
IR-192/194	Otero, Chaves, Eddy, Hudspeth, Culberson	Elk, Piñon, Avis, Lakewood, Seven Rivers, Weed	Livestock grazing, recreation and hunting, forestry, oil and gas extraction and exploration, dairy farms	State, BLM, DOD, USFS, private	Brantley Lake SP, and Guadalupe Escarpment, McKittrick, Lonesome Ridge, and Devils Den Canyon WSAs, and Sierra Diablo WMA, Black River RA, Chosa Draw RA
IR-102/141	Brewster, Culberson, Hudspeth, Jeff Davis, Pecos, Presidio, Reeves in Texas; Chaves, Eddy, Otero in New Mexico	Harvey, Warwick, Haymond, Terlingua Ranch subdivision, Kent, Borracho, Lobo, Cornudas, Small, Finlay, Lasca, Mile High, Sierra Blanca, Arispe, Chispa, Saltlick Mill, Chancellor, Dunken, Mayhill, Piñon, Weed	Livestock grazing, recreation and hunting, oil and gas extraction and exploration	State, BLM, DOD, USFS, NPS, private	Texas Mountain Trail (scenic route), Salt Flats (natural feature), Chihuahuan Desert (natural feature), Guadalupe Mtns. NP, Sierra Diablo WMA, Lincoln NF, Brokeoff Mountains WSA, Culp Canyon WSA, Wind Mountain Proposed ACEC, Alamo Mountain Proposed ACEC, Alkali Lakes Proposed ACEC

Appendix E-3. Land Use Information Underlying MTRs Used by Holloman Units (continued)

VR-176	Catron, Cibola, Grant, Lincoln, Luna, Otero, Sierra, Socorro, Torrance in NM; Apache, Greenlee in Arizona	Hillsboro, Nutt, Kingston, Caballo, Derry, Arrey, Los Palomas, Truth or Consequences, Val Verde, Engle, Oscuro, Bernardo, La Joya, Contreras, Blue Springs, Scholle, Nogal, Ancho, Abo, Socorro, Pope, Pogresio, Cedarvale, San Marcal, Tiffany, Bingham, Claunch, Carrizozo, White Oaks	Ranching crop production, forestry, mining, recreation, conservation	State, BLM, USFS, NPS, USFWS, private	Percha Lake SP, Caballo Lake SP, White Sands Missile Range, Elephant Butte SP/reservoir, Valley of Fires RA, Three Rivers Petroglyph RA, Pueblo Blanco Ruins, Alamo Navajo Indian Reservation, Salina Pueblo Missions National Monument (3 units), Gila NF, Lincoln NF, Cibola NF, Gila WA, Aldo Leopold WA, Withington WA, West Malpais WA, Blue Range WA, White Mountains WA, Sevilleta NWR, San Pascual WA, Eagle Peak WSA, Bosque Del Apache NWR, Devils Backbone WSA, Little Black Peak WSA, Carrizozo Lava Flows WSA, Antelope WSA, Jornada del Muerto WSA, Sierra Ladrones WSA, Stallion WSA, Presilla WSA, Veranito WSA, Sierra del las Canas WSA, Very Large Array (VLA) Astronomy Observatory, Ski Apache, Bonito Lake, Apache-Sitgreaves NF and Blue Range Primitive Area, Escudilla Mountain WA, Bernardo State Wildlife Area, La Joya State Waterfowl Area
VR-100/125	Socorro, De Baca, Quay, Curry, Roosevelt, Chaves, Lincoln, Torrance	Tucumcari, Santa Rosa, Yeso, Fort Sumner, Vaughn, Encino, Willard, White Oaks, Arabela, Montoya, Encinoso, Pine Lodge, Newkirk, Hassel, McAllister, Pedernel, Duran, Ricardo, Taiban, Cuervo, Carnero	Livestock grazing, crop production, oil and gas extraction, recreation and hunting	State, BLM, USFS, private	Sumner Lake SP, Santa Rosa Lake SP, Fort Sumner State Monument, Lincoln NF, Capitan Mountains WA
IR-178 (portions)	Hudspeth, Culberson, Jeff Davis, Presidio, Brewster, Pecos	Sierra Blanca, Plata, Terlingua Ranch subdivision, Warwick, Haymond	Livestock grazing, recreation	State, private	Texas Mountain Trail

Notes:

1. Does not include airfields or flight safety hazards or obstructions (e.g., towers, windmills, powerlines, avian migratory routes).

ACEC Area of Critical Environmental Concern
BLM Bureau of Land Management
DOD Department of Defense
IR Instrument Route
NF National Forest
NPS National Park Service
NWR National Wildlife Refuge
RA Recreational Area
SP State Park
USFS U.S. Forest Service
VR Visual Route
WA Wilderness Area
WMA Wilderness Management Area
WSA Wilderness Study Area

APPENDIX F

ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

MAR 0 6 1998

The Honorable Robert Lewis
Governor
Pueblo of Zuni
P.O. Box 339
Zuni, NM 87327

Dear Mr. Lewis,

The Air Force wishes to open a government to government dialogue with the Pueblo of Zuni concerning the Proposed Expansion of German Air Force Operations based at Holloman Air Force Base, New Mexico. We anticipate the principal area of interest to the Pueblo of Zuni will focus on aircraft operations in Military Training Route VR-176, which lies nearby. In order to describe the proposed action and begin the process of eliciting any tribal comments or concerns, we would like to meet with official representatives of the Pueblo of Zuni on March 10, 1998 (Tuesday) at 10:00 a.m. This date and time were arranged earlier with your office by telephone. A time period of approximately two hours would be appropriate to brief the proposal, begin the consultation process, and identify means for providing comments. For your information, we have already confirmed similar meetings with the Pueblo of Acoma at 10:00 a.m. on March 11 and the Ramah Navajo on March 11 at 3:00 p.m.

ROY L. BARKER
Acting Chief, Environmental Analysis Branch

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

MAR 0 6 1998

The Honorable Reginald Pasqual
Governor
Pueblo of Acoma
P.O. Box 309
Acomita, NM 87034

Dear Mr. Pasqual,

The Air Force wishes to open a government to government dialogue with the Pueblo of Acoma concerning the Proposed Expansion of German Air Force Operations based at Holloman Air Force Base, New Mexico. We anticipate the principal area of interest to the Pueblo of Acoma will focus on aircraft operations in Military Training Route VR-176, which lies nearby. In order to describe the proposed action and begin the process of eliciting any tribal comments or concerns, we would like to meet with official representatives of the Pueblo of Acoma on March 11, 1998 (Wednesday) at 10:00 a.m. This time was arranged earlier with your office by telephone. A time period of approximately two hours would be appropriate to brief the proposal, begin the consultation process, and identify means for providing comments. For your information, we have already confirmed similar meetings with the Pueblo of Zuni at 10:00 a.m. on March 10 and the Ramah Navajo on March 11 at 3:00 p.m.

RLB

ROY L. BARKER
Acting Chief, Environmental Analysis Branch

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

MAR 06 1998

The Honorable Curley Biggs
President
Ramah Navajo Chapter
Rt 2, Box 13
Ramah, NM 87321

Dear Mr. President,

The Air Force wishes to open a government to government dialogue with the Ramah Navajo concerning the Proposed Expansion of German Air Force Operations based at Holloman Air Force Base, New Mexico. We anticipate the principal area of interest to the Ramah Navajo will focus on aircraft operations in Military Training Route VR-176, which lies nearby. In order to describe the proposed action and begin the process of eliciting any tribal comments or concerns, we would like to meet with official representatives of the Ramah Navajo on March 11, 1998 (Wednesday) at 3:00 p.m. This time was arranged earlier with your office by telephone. A time period of approximately two hours would be appropriate to brief the proposal, begin the consultation process, and identify means for providing comments. For your information, we have already confirmed similar meetings with the Pueblo of Zuni of March 10 at 10:00 a.m. and the Pueblo of Acoma on March 11 at 10:00 a.m.

ROY L. BARKER
Acting Chief, Environmental Analysis Branch

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

MAR 0 6 1998

The Honorable Roland Johnson
Governor
Pueblo of Laguna
P.O. Box 194
Old Laguna, New Mexico 87026

Dear Mr. Johnson,

Our letter of March 4, 1998 requested a government to government meeting concerning the Proposed Expansion of German Air Force Operations based at Holloman Air Force Base, New Mexico. As you know, we were unable to arrange a suitable time with you during the week of March 9th. At your convenience, please inform us when a suitable date and time is available for us to visit, provide information, and listen to your comments. Our point of contact is Dr. Paul Green at (757) 764-9335.

ROY L. BARKER
Acting Chief, Environmental Analysis Branch

MFR

10 Dec 97

TO: ACC/CEVAP (S. Parker)

SUBJECT: Cultural Resource Report

1. The attached Report and Indorsement from the NM SHPO is forwarded for your records.

2. I will coordinate with the HAFB Project Engineer, Mr. Richard Fry, to ensure he knows the location of this archaeological site in relation to the proposed facility construction area.

Bob Johnson, GS-11
49CES/CEVA

Atch: Cultural Resource Report dated 18 Nov 97

cc: Marty Tagg w/o atch
Richard Fry w/atch

Sheryl: Marty advised me this date that he ~~previously~~ showed Richard the arch. site.

Bob
10 Dec 97

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

054349 18 NOV 1997

MEMORANDUM FOR NEW MEXICO STATE HISTORIC PRESERVATION OFFICER
Attn: Dr. Lynne Sebastian
Villa Rivera, Room 101
228 East Palace Avenue
Santa Fe, NM 87503

RECEIVED
Dec 2
NOV 21 1997
HISTORIC PRESERVATION DIVISION

FROM: 49 CES/CEV
550 Tabosa Ave
Holloman AFB, NM 88330-8458

SUBJECT: Cultural Resource Report

1. Attached is a copy of a Holloman AFB (HAFB) cultural resource report for the German Air Force Munitions Storage Area project (HAFB 1997-011). The project will consist of construction of a new facility in a previously-undisturbed locale.

2. One archaeological site was located during the survey of the locale. HAR-361 (LA 120,407) is a prehistoric artifact scatter with features. The site is considered potentially eligible for the National Register of Historic Places (NRHP). The site shall be avoided by ground disturbing activities, so there will be no effect on cultural resources.

3. Your review and concurrence with the report and the recommendations concerning cultural properties are requested.

4. Point of contact for this transaction is Marty Tagg, (505) 475-3931.

Howard E. Moffitt
HOWARD E. MOFFITT
Deputy Base Civil Engineer

Attachment:
German Air Force Munitions Storage Area Report (HAFB 1997-011)

Global Power for America

1st Ind, NM SHPO

To: 49 CES/CEV

Concur/~~Nonconcur~~ on above-mentioned report.

12-3-97

(signature of SHPO, date)

21 FEB 1997

MEMORANDUM FOR MESCALERO APACHE TRIBE
Attn: Ms Lisa Meyer
PO Box 176
Mescalero NM 88340

FROM: 49 CES/CEV
550 Tabosa Avenue
Holloman AFB, New Mexico 88330-8458

SUBJECT: Proposed Expansion of German Air Force Operations at Holloman AFB

1. Holloman Air Force Base (HAFB) is in the process of preparing an Environmental Impact Statement (EIS) addressing the proposed expansion of German Air Force (GAF) operations. HAFB is producing the EIS in compliance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality regulations implementing NEPA, the Federal Land Policy and Management Act (FLPMA), Air Force Instruction 32-7061, and other applicable federal and state-delegated environmental legislation.

2. The proposal consists of three components: construction of additional facilities at HAFB, increased tactical target complex access, and increased use of existing airspace. Target complex analyses would address increased use of Melrose Range near Cannon AFB and construction of a new complex on McGregor Range. Two potential locations have been selected for further analysis on McGregor. The proposal also includes 24 additional annual supersonic sorties within the existing White Sands Missile Range airspace. The maps at Attachments 1 and 2 illustrate the existing airspace, whereas the two locations to be analyzed on McGregor for a target complex are shown in Attachment 3. Cultural resource surveys are planned for these latter locations.

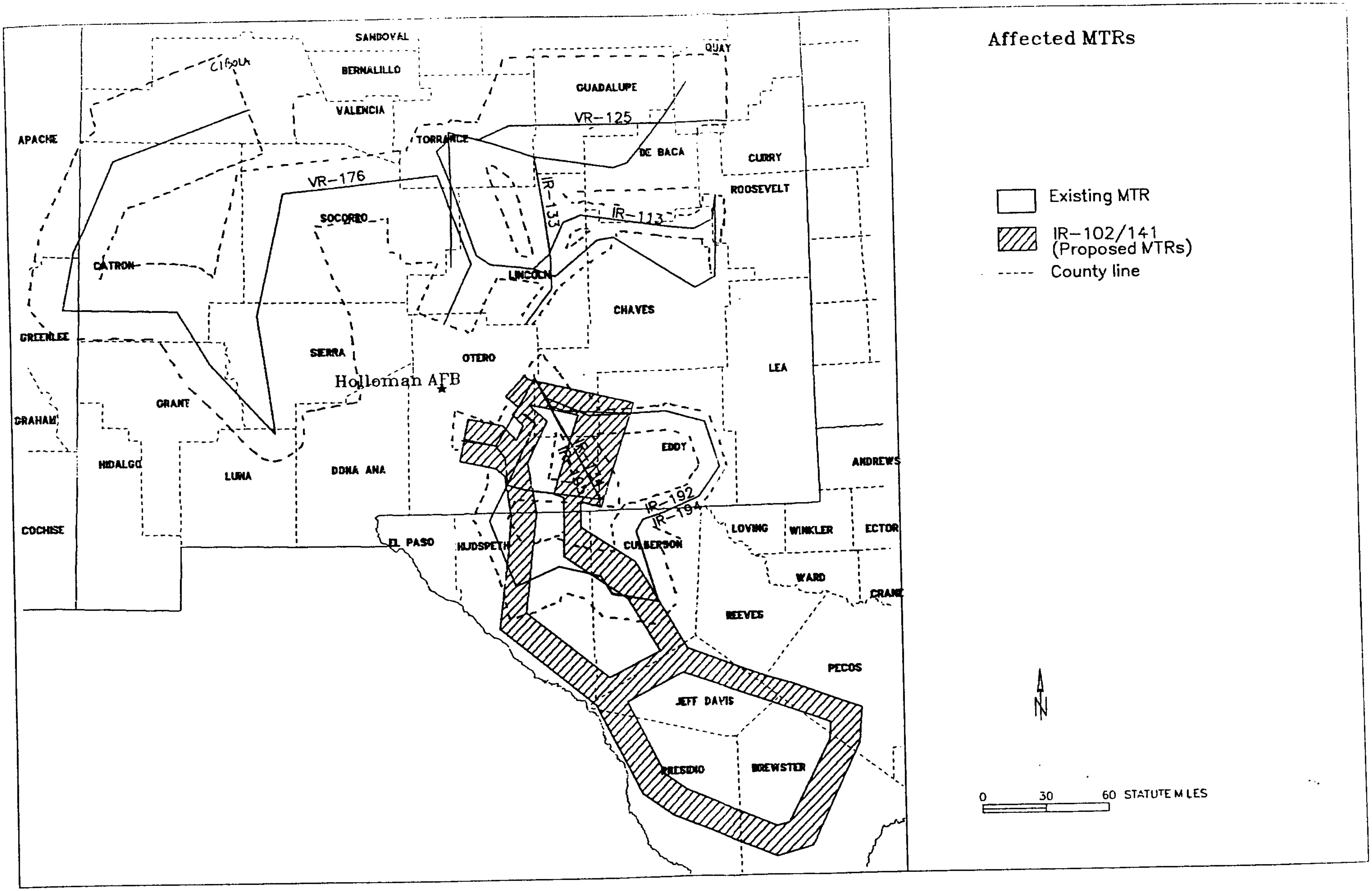
3. Please review the enclosed maps and contact us if the Mescalero Apache Tribe has any concerns regarding this proposal.

4. Our Cultural Resource point of contact for this proposal is Mr. Marty Tagg at (505) 475-3931.

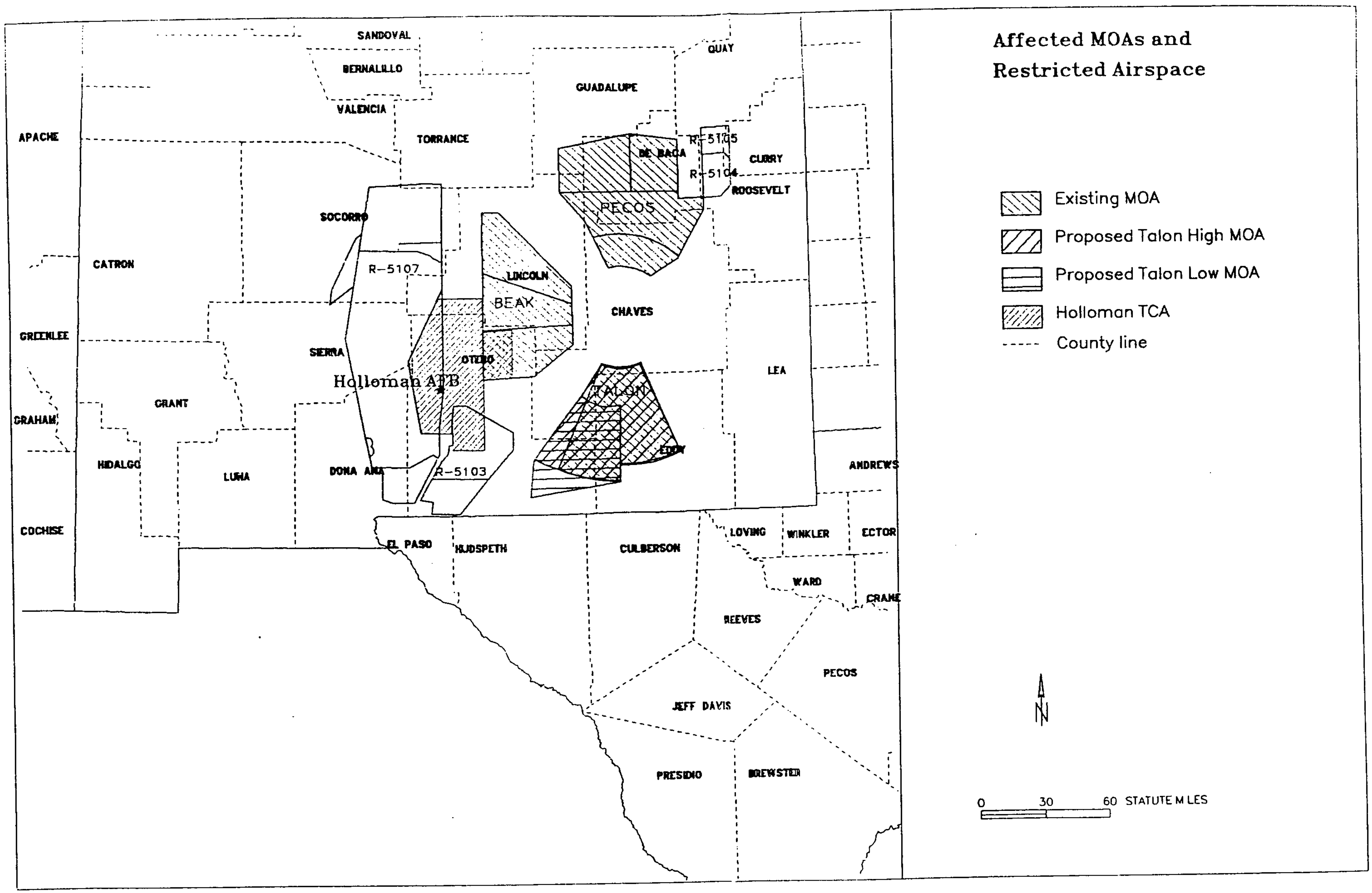
SIGNED
HOWARD E. MOFFITT
Deputy Base Civil Engineer

Attachments:
1. Affected Military Training Routes map
2. Affected Military Operating Areas and Restricted Airspace map
3. Tactical Target Complex Alternatives map

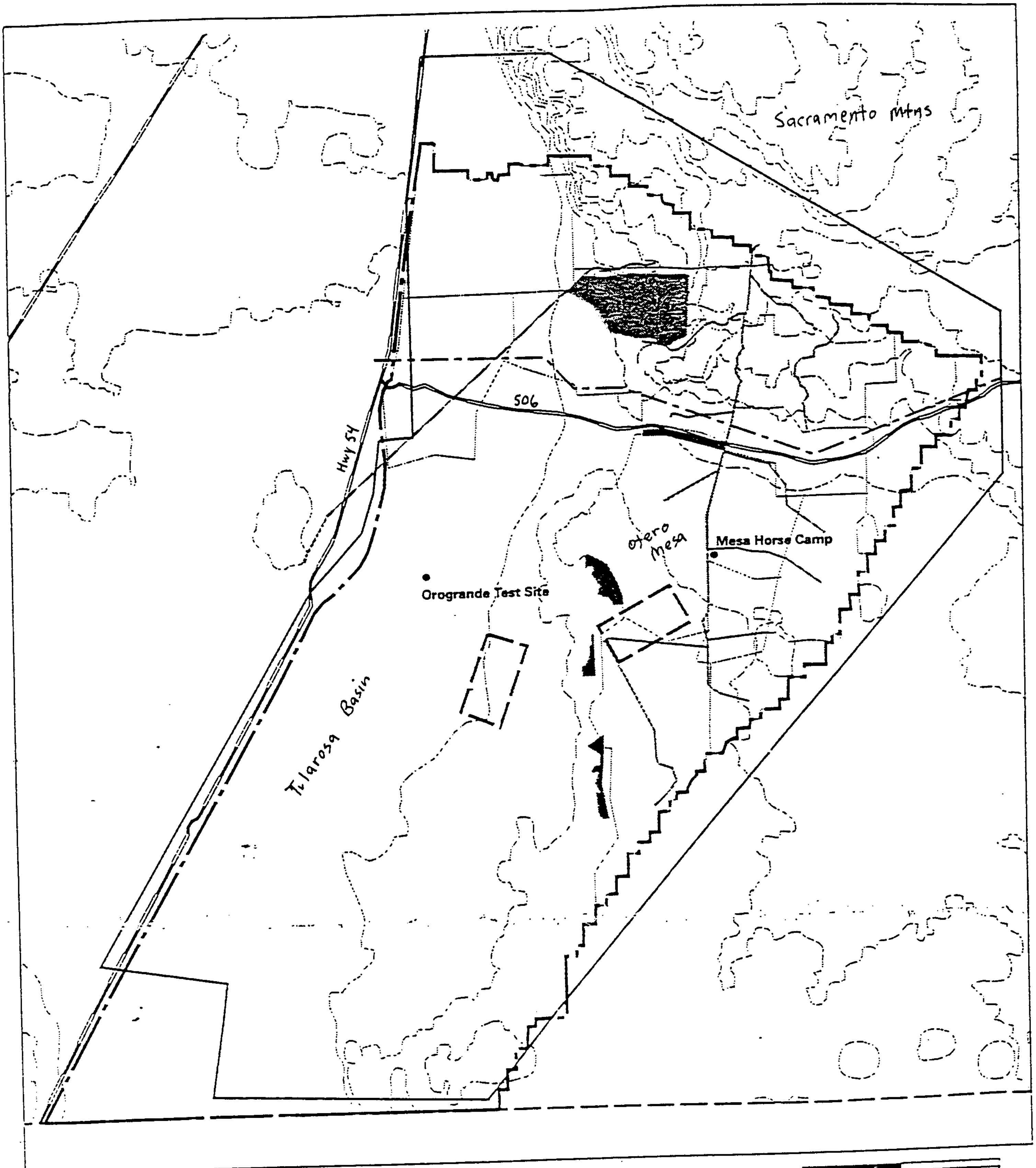
Deborah Hertel 20 Feb 97



Attachment 1



Attachment 2



LEGEND

Culp Canyon WSA

Grassland Research Area

500 ft elevation contours

McGregor Range Boundary

Restricted Air Space R-5103

Grazing Unit Boundary

245 kV Transmission Line

Potential Target Location

0 5 10
Scale in Miles

0 5 10
Scale in Nautical Miles

Scale: 1:420000

Proposed McGregor
Target Locations

Attachment 3

MESCALERO Apache TRIBE

Wendell Chino, President | Mescalero, New Mexico 88340

March 3, 1997

Mr. Marty Tagg
Holloman Air Force Base
Base Archaeologist
49 CES/CEV
550 Tabosa Avenue
Holloman AFB, New Mexico 88330-8458

CERTIFIED - RETURN RECEIPT REQUESTED

Re: Environmental Impact Statement (EIS) for Proposed Expansion of German Air Force Operations.

Dear Mr. Tagg:

This letter is in response to Mr. Howard E. Moffitt's letter dated February 21, 1997, regarding the Environmental Impact Statement (EIS) to be prepared by Holloman AFB, addressing the proposed expansion of the German Air Force (GAF) operations. The Tribe is concerned over the proposed project and potential impacts to Traditional Cultural Properties, heritage resources, and traditional plant gathering areas and requests that Holloman AFB make a presentation to the Cultural Affairs Committee and Traditional Religious Leaders at the Mescalero Apache Indian Reservation regarding the proposed operations.

The Tribe appreciates your prompt attention to this matter. We thank you for the consultation opportunity and look forward to consultation and commenting on future efforts. If you have any questions please feel free to call me at 671-4494 ext. 270.

Sincerely,

Lisa M. Meyer
Historic Preservation Specialist

cc: Wendell Chino, President

5 May 1997

MEMORANDUM FOR MESCALERO APACHE TRIBE
Attn: Ms Lisa Meyer
PO Box 176
Mescalero NM 88340

FROM: 49 CES/CEV
550 Tabosa Avenue
Holloman AFB NM 88330-8458

SUBJECT: Proposed McGregor Range Tactical Target Complex Consultation Meeting

1. When we talked on the telephone in March, I understood you were hoping to arrange a meeting in early April with the Mescalero. Holloman's plan was to present information regarding the proposed McGregor Range Tactical Target Complex.

2. Obviously, we have not gotten together as planned, and Holloman wants to ensure the Mescalero have had an opportunity to understand and express their concerns regarding this undertaking. Please confirm the tribal government wishes us to do this. I'd like to plan a mutually convenient time in the not too distant future. You can reach me at 475-3931.

Marty

MARTYN D. TAGG
Base Archaeologist

MESCALERO Apache TRIBE

Wendell Chino, President | Mescalero, New Mexico 88340

June 3, 1997

Mr. Martyn Tagg
Base Historic Preservation Officer
49 CES/CEV
550 Tabosa Avenue
Holloman Air Force Base, New Mexico 88330-8458

CERTIFIED - RETURN RECEIPT REQUESTED

Re: Environmental Impact Statement for the Proposed German Air Force Operations Expansion.

Dear Mr. Tagg:

Thank you for the presentation last evening and providing the Mescalero Apache Tribe the opportunity for consultation regarding the Holloman Air Force Base (HAFB) Environmental Impact Statement (EIS) for the proposed expansion of the German Air Force operations on Fort Bliss. Two additional questions have been raised which are presented below for your response.

1) Does HAFB have a signed Programmatic Agreement with the Advisory Council on Historic Preservation? If so, may we receive a copy of the agreement for our perusal?

2) What significant impacts were identified in the proposed project locations to necessitate an EIS?

We would appreciate receiving your response prior to Tribal review of the EIS. The Tribe appreciates your attention to this matter, and we thank you again for the consultation opportunity. If you have any questions please feel free to call me at 671-4637 or 671-4494 and leave a message.

Sincerely,

Lisa M. Meyer

Lisa M. Meyer
Historic Preservation Specialist

cc: Wendell Chino, President

MEMORANDUM FOR MESCALERO APACHE TRIBE
Attn: Ms Lisa Meyer
PO Box 227
Mescalero NM 88340

04 JUN 1997

FROM: 49 CES/CEV
550 Tabosa Avenue
Holloman AFB, New Mexico 88330-8458

SUBJECT: Information Meeting Sign-in Sheet

1. Enclosed is a copy of the sign-in sheet for the 2 June information meeting between Holloman AFB (HAFB) and the Mescalero Apache Tribe. I noticed that a number of Mescalero individuals did not sign the sheet. Would you check with Mr. Miller, and have him add those individuals whose names are not on this list. I would like a complete list for my files.

2. The final cultural resources survey for the proposed tactical target complexes should be completed in the next few months. Ft. Bliss has the authority to distribute this report, since it is on lands administered by that agency. Mr. Jim Bowman, Ft. Bliss Archaeologist, has agreed to provide you with a copy of the report when it is completed.

3. Mr. Bob Johnson of my office is compiling a list of Department of Defense Natural Resource Managers to provide to Mr. Blazer of the Bureau of Indian Affairs. Mr. Johnson should be calling you with this information soon.

4. Thank you for setting up the meeting to discuss the German Air Force beddown project. I felt the meeting went well, and hope the questions and concerns of the Mescalero Apache Tribe have been answered. If you wish to tour the proposed tactical target complexes, please contact Mr. Bowman at Ft. Bliss. He can make the necessary arrangements for accessing the range. If you have any further questions about the project, don't hesitate to call me at 475-3931.

MARTYN D. TAGG
Base Archaeologist

Attachment:
Sign-in Sheet, Holloman/Mescalero Meeting, 2 June 1997

SIGN-IN SHEET
HOLLOMAN/MESCALERO MEETING
2 June 1997, 1700 at Mescalero NM

NAME	ORGANIZATION	TITLE
1. Kurt Cichowski	49 OG Holloman AFB	Commander 49 OG
2. Don Hargarten	49 OG Holloman AFB	Assist. Deputy Cdr 49 OG
3. Jim Bowman	Ft. Bliss DOE-C	Archaeologist
4. Lawrence Cox	Holloman AFB Public Affairs	Public Affairs Officer
5. Bob Johnson	49 CES/CEV	Environmental Scientist
6. Paul Green	HQ ACC CEV, Langley AFB VA	Command Cultural Resource Manager
7. Marty Tagg	49 CES/CEV Holloman	Holloman Cultural Resource Mgr
8. Greg Quinlan	Mescalero Apache Tribe	Tribal Atty
9. ARTHUR L. BLAZER	BUREAU OF INDIAN AFFAIRS	Acting AGENCY SUPERINTENDENT
10. Lisa M. Meyer	Mescalero Apache Tribe	Historic Pres. Spec.
11. Ellyn Bigrope	" " "	Museum Curator
12. Keith Miller	" " "	Vice President
13. Ray Menchez	TRIBAL COUNCIL	Mescalero
14. Berle Kanseah	Tribal Council	Box #176 Mescalero N. Mex.
15. Arden Comanche	Medicine man	Mescalero NM 88340
16. Oliver Enjady	TRIBAL COUNCIL	"
17. Paul Ortega	"	"
18. Raymond Kingad	"	"
19. Lewis Lapaz	"	"
20. Mr. Latham	"	
21.		
22.		
23.		
24.		

MEMORANDUM FOR MESCALERO APACHE TRIBE
Attn: Ms Lisa Meyer
PO Box 227
Mescalero NM 88340

11 JUN 1997

FROM: 49 CES/CEV
550 Tabosa Avenue
Holloman AFB, New Mexico 88330-8458

SUBJECT: Response to Presentation Questions

1. Holloman Air Force Base (HAFB) does not have a signed Programmatic Agreement with the Advisory Council on Historic Preservation.

2. Mr Bob Johnson fielded the second question, and offers the following response. Several factors necessitated an Environmental Impact Statement (EIS) for the German Air Force Beddown Project. They are:

a. Air Force Instruction (AFI) 32-7064, which implements the Air Force's environmental impact analysis process, states which types of actions require an EIS. These instructions carry out the mandate of the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508, especially para 1507.3) which implement the National Environmental Policy Act (NEPA). The AFI lists classes of environmental impacts and actions that require the preparation of an EIS. They include "substantial environmental controversy concerning the significance or nature of the environmental impact of a proposed action." It further states that an EIS is "normally required" for the "establishment of new air-to-ground weapons ranges."

b. The scope and magnitude of all elements of the proposed action indicated that an Environmental Assessment, which results in a Finding of No Significant Impact, was not appropriate or defensible. The proposed action currently undergoing analysis includes not only the possible establishment of a new range, but also construction of approximately 40 new facilities at HAFB, the addition of 30 aircraft, and an additional 650 support personnel and their families.

c. During the initial evaluation of the proposed action, the proponent (Headquarters, Air Combat Command), anticipated impacts on land use, air quality, noise, natural and cultural resources, and socioeconomics. The public input at the scoping meetings also identified these as well as other environmental concerns to be analyzed.

3. I hope these responses answer your questions. If you have any further questions or need additional information, don't hesitate to contact me. Thank you for your interest in the project.

Martyn D. Tagg

MARTYN D. TAGG
Base Archaeologist

MESCALERO Apache TRIBE

Wendell Chino, President | Mescalero, New Mexico 88340

August 29, 1997

U.S. Air Force
Headquarters Air Combat Command/CEVA
Attn: Cheryl Parker
11817 Canon Blvd., Suite 500
Newport News, Virginia 23606-2558

CERTIFIED - RETURN RECEIPT REQUESTED

Re: Draft EIS for the Proposed Expansion of German Air Force Operations at Holloman AFB, New Mexico.

Dear Ms. Parker:

On June 2, 1997, Mescalero Apache Tribal representatives met with representatives from Holloman AFB (HAFB) and Fort Bliss to discuss the proposed German Air Force Expansion. During that meeting Tribal representatives expressed concerned over the potential negative impacts to cultural resources; particularly on or near Otero Mesa. The Tribe requested that Holloman AFB provide the Tribe with the cultural resources inventory that was conducted for the Draft EIS, so that this information could be reviewed and assessed by the Tribe prior to the Tribe's submittal of comments on the Draft EIS. The Tribe was assured by Mr. Martyn D. Tagg, HAFB Base Archaeologist, that this information would be provided. To date, the Tribe has not received any documentation from Holloman AFB regarding the cultural resources inventory. Needless to say, since the necessary information requested by the Tribe was not received the Tribe cannot adequately comment on the Draft EIS.

The area of concern falls within the traditional homelands of the Mescalero Apache, and was utilized by several other Apachean groups. Apache archaeological sites; a marked, but hidden spring, and an Apachean trail are known to exist in the proposed project area; specifically Otero Mesa; however the Draft EIS does not address these sites. This leads the Tribe to believe that the cultural resources inventory may be inadequate.

All archaeological sites pertaining to Native American peoples, whether Apache or non-Apache, are considered as revered places, as these are locations where people utilized a place or landscape for the production, reproduction, and maintenance of their social, technological, spiritual and political systems. Therefore, without the requested cultural resources information it is difficult to assess the impacts to the sites identified, and to comment on the National Register eligibility of those sites.

It is the Tribe's position that No Action be taken on this proposed project until the request cultural resources inventory be reviewed and addressed by the Tribe. Furthermore, it is recommended that this letter be incorporated into the EIS, and remain in the document throughout the agency review process.

If you have any questions, please feel free to contact me at (505) 671-4711.

Sincerely,

L. M. Meyer

Lisa M. Meyer
Tribal Historic Preservation Specialist

cc: Mr. Wendell Chino, President Mescalero Apache Tribe
Mr. Gregory M. Quinlan, Attorney at Law
Ms. Claudia Nissley, Native American Affairs Coordinator, Advisory Council on Historic Preservation
Dr. Lynne Sebastian, State Historic Preservation Officer

APPENDIX G

SOCIOECONOMICS

G.1 INTRODUCTION

The National Environmental Policy Act (NEPA) requires the analysis of the impact of a Federal agency's proposed action on the environment. The environment is a broad term that encompasses both natural and human aspects located within close proximity to the action and, potentially, within more distant locations that can be indirectly affected by the action. It is important how to examine the action can affect people's interactions both economically and socially. The term for describing the range of potential impacts an action can have on the human environment is socioeconomics.

As indicated in Section 3.9.1, the Region of Influence (ROI) selected for this assessment is the three-county region of Doña Ana, New Mexico, El Paso, Texas, and Otero, New Mexico. Impact assessment is also conducted for Otero County. The two regional areas are evaluated is that each geographic specification reflects different relative impacts. The smaller of the two regions (Otero County) is expected to have relatively larger share of the regional impacts since all the direct effects occur in that county. However, Otero County is a small portion of the total ROI and is relatively rural. Therefore, its multipliers in the input-output matrices tend to be small, which can reduce the size of the estimated secondary employment impacts. For this reason, the three-county ROI, that includes the larger economic trade areas of Las Cruces and El Paso, is also examined.

Section G.2 contains additional information on historical trends in socioeconomic data for the ROI. Section G.3 introduces the methodological approach used to estimate impacts. Estimates of impacts to employment, population and households for the ROI and Otero County are in Section G.4.

G.2 HISTORICAL TRENDS AND BASELINE DESCRIPTION

This section contains additional details on the economic and demographic characteristics of the ROI, Otero County, and Alamogordo, supplementing the information in Section 3.1.9.

G.2.1 Population

The ROI's 25-year average annual population growth (2.60 percent) is higher than the comparable state-level rates: New Mexico grew at an average annual rate of 2.02 percent from 1970 to 1994; Texas grew an average of 2.07 percent per year. In contrast, Otero County population growth (1.14 percent) has been only slightly higher than the U.S. average (1.00 percent).

The ROI population growth from 1990 to 1994 was slightly higher than the 25-year average annual growth, increasing to 2.75 percent per year from the average of 2.60 percent per year. From 1993 to 1994, ROI population increased by 2.71 percent. For Otero County, the growth from 1990 to 1994 averaged 1.19 percent per year.

However, Otero population growth more than doubled from 1993 to 1994, increasing to 2.84 percent, which was higher than the one-year growth in any other regional area reported in Table G.2.1-1 (Dõna Ana at 2.44 percent, El Paso at 2.77 percent, New Mexico at 2.35 percent, Texas at 1.98 percent, and U.S. at 0.99 percent).

They show a somewhat slower growth in population from 1994 to 2000 than reported from 1970 to 1994. The average annual growth is forecasted to decline to 0.95 percent per year from the 25-year historical average annual level of 1.14 percent.

Table G.2.1-1 shows the distribution of population by sex and age in Otero County. The values for 1990 were reported in the 1990 Census of Population; the values for 1995 and 2000 are OCEDC projections. There are slightly more males than females for all three years shown in the table. However, there is a pattern to that difference: there are generally more males than females through the age range 30 to 39; the older age groups show more females. In looking at the forecasted trends by age group, the share of the population of working-age adults is expected to remain roughly constant (increasing by approximately 0.5 percentage points) from 1990 to 2000. However, the share of the population in school, estimated at approximately 39 percent in 1990, is expected to decline to 37 percent in 2000. The share of persons of retirement age is expected to increase from approximately 8.5 percent of the population in 1990 to slightly more than 10 percent in the year 2000. This pattern in Otero County is consistent with the overall pattern in the U.S. of the aging of the baby boom generation, most of whom are now middle-aged.

Distributions of population by race and ethnicity for the ROI, Otero County, Alamogordo, New Mexico, Texas, and the U.S. in 1990 are shown in Table G.2.1-2. In 1990, the population of Alamogordo was 27,596 or 53.14 percent of the total population in Otero County. Most people in Alamogordo are white (82.74 percent), slightly higher than the average for the U.S. (80.29 percent). The estimated share of the Alamogordo population of Hispanic origin (which can be of any race, including white) is 25.00 percent, nearly three times the national average share of 8.99 percent. The pattern for Otero County is similar to Alamogordo, with the major exception being the share of the population with an American Indiana heritage. In Alamogordo, only 0.84 percent of the population is American Indian; in Otero County, that share is 5.75 percent, reflecting the location of the Mescalero Apache Indian Reservation in the northeastern corner of the county. More than half of the ROI population is of Hispanic origin; the share for the ROI is 64.24 percent, much greater than the average for New Mexico (38.23 percent) and Texas (25.55 percent).

Table G.2.1-3 provides additional perspectives on population characteristics. Otero County is predominantly rural, with an average number of eight persons per square mile compared to the ROI and U.S. average population density of 72 people/sq mi. A relatively high share of the population aged 25 and over are high school graduates in Alamogordo and Otero (82.0 percent and 81.6 percent, respectively). For the U.S., only 75.2 percent of the over-24 population graduated from high school; for the ROI,

Table G.2.1-1. Projected Population for Otero County, by Age and Sex, 1990, 1995 and 2000

	Population*			Population Share (%)		
Age Group	1990	1995	2000	1990	1995	2000
Females						
0 - 9	4,774	4,730	4,616	9.17%	8.63%	8.04%
10-19	3,838	4,371	4,724	7.38%	7.98%	8.22%
20-29	4,357	3,727	3,818	8.37%	6.80%	6.65%
30-39	4,027	4,567	4,296	7.74%	8.34%	7.48%
40-49	2,812	3,422	4,003	5.40%	6.25%	6.97%
50-59	2,247	2,336	2,776	4.32%	4.26%	4.83%
60-69	1,977	1,943	1,956	3.80%	3.55%	3.41%
70+	1,644	2,088	2,419	3.16%	3.81%	4.21%
All Females	25,676	27,184	28,608	49.34%	49.61%	49.81%
Males						
0 - 9	4,886	4,980	4,778	9.39%	9.09%	8.32%
10-19	4,034	4,286	4,746	7.75%	7.82%	8.26%
20-29	5,142	4,474	4,180	9.88%	8.17%	7.28%
30-39	4,148	4,850	5,003	7.97%	8.85%	8.71%
40-49	2,926	3,416	3,763	5.62%	6.23%	6.55%
50-59	2,089	2,112	2,591	4.01%	3.85%	4.51%
60-69	1,841	1,938	1,923	3.54%	3.54%	3.35%
70+	1,293	1,552	1,845	2.48%	2.83%	3.21%
All Males	26,359	27,608	28,829	50.66%	50.39%	50.19%
Both sexes						
0-9	9,660	9,710	9,394	18.56%	17.72%	16.36%
10-19	7,872	8,657	9,470	15.13%	15.80%	16.49%
20-29	9,499	8,201	7,998	18.26%	14.97%	13.92%
30-39	8,175	9,417	9,299	15.71%	17.19%	16.19%
40-49	5,738	6,838	7,766	11.03%	12.48%	13.52%
50-59	4,336	4,448	5,367	8.33%	8.12%	9.34%
60-69	3,818	3,881	3,879	7.34%	7.08%	6.75%
70+	2,937	3,640	4,264	5.64%	6.64%	7.42%
All Ages	52,035	54,792	57,437	100.00%	100.00%	100.00%

*Number of people as of July 1 of reported year.
Source: Otero County Economic Development Council, Inc., 1996, p. 3 and SAIC calculations.

Table G.2.1-2. Race and Ethnicity by Region, 1990

Region	White	Black	American Indian	Other	Hispanic*
Alamogordo	82.74%	6.04%	0.84%	10.38%	25.00%
Otero County	79.56%	5.31%	5.75%	9.38%	23.84%
ROI**	79.23%	3.47%	0.85%	16.45%	64.24%
New Mexico	75.64%	1.99%	8.87%	13.50%	38.23%
Texas	75.21%	11.90%	0.39%	12.50%	25.55%
United States	80.29%	12.06%	0.79%	6.86%	8.99%

*Persons of Hispanic Origin can be of any race.
**Includes Doña Ana and Otero Counties in New Mexico and El Paso County in Texas.
Source: U.S. Bureau of the Census, 1994.

Table G.2.1-3. Other Population Characteristics by Region, 1990

Region	Land Area (Sq Mi)	Persons Per Sq Mi 1992	Percent Foreign Born	Language at home not English*	Language at home is Spanish*	Percent over-24 HS Graduates
Alamogordo	17.1	1,612	6.1%	20.6%	17.1%	82.0%
Otero County	6,627	8	5.7%	21.3%	16.8%	81.6%
ROI**	11,447	72	21.1%	61.2%	58.7%	66.0%
New Mexico	121,365	13	5.3%	35.5%	27.9%	75.1%
Texas	261,914	68	9.0%	25.4%	22.1%	72.1%
United States	3,536,278	72	7.9%	13.8%	7.5%	75.2%

*Persons 5 years old and older.
**Includes Doña Ana and Otero Counties in New Mexico and El Paso County in Texas.
Source: U.S. Bureau of the Census, 1994.

this share drops to 66.0 percent. The shares of the population whose language spoken at home is something other than English emphasize areas where there may be difficulties in obtaining jobs (unless the employer allows language spoken on the job to be other than English). In Alamogordo, the share of the population whose language at home is not English is 20.6 percent. For Otero County, the comparable share is 21.3 percent. These shares are high relative to the U.S. average of 13.8 percent, but lower than the values for the ROI (61.2 percent), New Mexico (35.5 percent), and Texas (25.4 percent).

G.2.2 Employment and Income

Employment statistics are shown in Table 3.9-1. Growth in ROI employment between 1970 and 1994 was approximately 50 percent greater than the average annual growth for the total U.S. employment; ROI growth averaged 2.90 percent per year and U.S. growth was 1.94 percent over the same period. The ROI's 25-year average annual population growth is lower than the comparable state-level rates: New Mexico grew at an average annual rate of 3.29 percent from 1970 to 1994; Texas grew an average of 2.98 percent per year. In contrast, Otero County employment growth has been lower than the U.S. average. From 1970 to 1994, Otero population increased at an average annual rate of 1.37 percent.

The ROI employment growth from 1990 to 1994 was lower than the 25-year average annual growth, declining from 2.90 percent from 1970 to 1994 to 2.15 percent from 1990 to 1994. From 1993 to 1994, ROI employment grew by 2.24 percent, still well below its 25-year average. For Otero County, the growth from 1990 to 1994 averaged 0.38 percent per year. Although Otero employment growth increased again from, 1993 to 1994, to 1.27 percent, its job growth was lower than the one-year growth in any other regional area reported in Table 3.9-1 (Doña Ana at 2.16 percent, El Paso at 2.34 percent, New Mexico at 4.04 percent, Texas at 3.18 percent, and U.S. at 2.54 percent).

In 1994, three ROI employment sectors accounted for more than half the total: 23.32 percent were service jobs (90,416 of 387,641); 17.56 percent (68,056) were for retail establishments; and 13.39 percent (51,913) were in manufacturing. From 1970 to 1994, service sector jobs grew the fastest of the three, averaging an annual growth of 4.63 percent. However, in 1993 to 1994, the service sector grew the slowest of the three, increasing at only 0.86 percent. For Otero County, services, retail, and manufacturing jobs accounted for less than half the total in 1994 (reflecting the importance of government employment in the County, including Federal, state, and local jobs, which account for more than one-fourth of total employment). Manufacturing employment declined in Otero County (averaging -0.18 percent per year from 1970 to 1994), and retail sales growth has been higher than growth in the service sector (3.15 percent per year for retail and 2.60 percent per year for services from 1970 to 1994).

Table 3.9-2 shows the forecasted trends in Otero County employment consistent with the population projections. Overall employment growth is estimated to be approximately 0.30 percent per year, slightly lower than the 0.38 percent growth reported for 1990 to 1994. Table G.2.2-1 lists the major employers in Otero County. Unemployment rate trends are shown in Table G.2.2-2.

Average annual earnings were higher in New Mexico ($23,100), Texas ($27,092) and the U.S. ($28,291) in 1994 than they were in the ROI ($21,277). Otero County reported average earnings of $21,505, which is slightly higher than the ROI but again lower than average earnings in New Mexico, Texas, and U.S. Comparing the 25-year average annual growth in the current dollar value of earnings per worker for the five regions, Texas experienced the fasted growth in earnings (6.05 percent from 1970 to 1994) followed by the U.S. (5.86 percent), New Mexico (5.42 percent), the ROI (almost equal to New Mexico at 5.41 percent) and Otero County (4.84 percent).

Table 3.9-2 shows the forecasted trends in Otero County average earnings consistent with the population projections. Overall average earnings growth is estimated to be 2.41 percent per year, somewhat lower than the 3.47 percent growth reported for 1990 to 1994.

Table G.2.2-3 shows the results of the Southeastern New Mexico Small Employer Wage Survey conducted for the third quarter in 1995. The estimated average annual wage for the employees surveyed was $22,300. For clerical jobs, the average salary was $16,200; for skilled/semi-skilled workers, the average was estimated to be $23,300; and for professional/managerial positions, the average was estimated to be $30,700.

Average annual per capita income (in current dollars) was reported to be $13,159 in the ROI in 1994 (see Table 3.9-1). Per capita income was higher in New Mexico ($17,038), Texas ($19,716) and the U.S. ($21,696). Otero County reported average per capita income of $14,298, which is slightly higher than the ROI but lower than the average per capita income in New Mexico, Texas, and the U.S. Comparing the 25-year average annual growth in the current dollar value of per capita income for the five regions, Texas experienced the fastest growth in earnings (7.32 percent from 1970 to 1994), followed by New Mexico (almost equal to Texas at 7.30 percent), the U.S. (7.25 percent), Otero County (6.69 percent) and the ROI (6.42 percent).

Table 3.9-2 shows the forecasted trends in Otero County per capita income consistent with the population projections. Overall average per capita income growth is estimated to be 3.31 percent per year, somewhat lower than the 4.16 percent growth reported for 1990 to 1994.

Table G.2.2-4 gives a perspective on selected income statistics for the three local regions and compares the local numbers with the values for the states of New Mexico and Texas, and the U.S. Median household income is higher in Alamogordo than it is for Otero County or the ROI. This result reflects the

Table G.2.2-1. Major Employers in Otero County

Employer	Industry	No. of Employees
Holloman Air Force Base	Defense - Military (U.S. & GAF)	4,950
Holloman Air Force Base	Defense - Civilian (U.S. & GAF)	950
Inn of the Mountain Gods	Mescalero Resort	900
Alamogordo Public Schools	Education	750
Gerald Champion Memorial Hospital	Medical	325
Lockheed-Martin	Government Contracts	300
City of Alamogordo	City Government	300
Van Winkles IGA	Grocery Chain	300
DYN Corporation	Government Contracts	280
Presto Products	Small Appliances	220
New Mex. School for Visually Handicapped	Education	184
Wal-Mart	Retail	160
White Sands Research Center	Bio-Research	146
New Mexico State University, Alamogordo	Education	134
Casa Arena Blanca	Nursing Home	125
First National Bank	Financial	100
Kmart	Retail	100
The Lodge	Cloudcroft Resort	100
White Sands Forest Products	Studs & Chips	100
Albertson's	Grocery	87
Smith's	Grocery	85
Alexander Molding Mill	Molding	75

Source: Otero County Economic Development Council, Inc., 1996; Holloman II DOPPA.

Table G.2.2-2. Unemployment Rates, Selected Years, 1982 to 1996

Year	Otero County	New Mexico	Texas	United States
1982	8.0	9.2	6.9	9.7
1986	8.1	9.2	8.9	7.0
1990	8.9	6.9	7.1	6.3
1994	7.7	6.3	6.4	6.1
1995	5.7	6.3	6.0	5.6
1996	7.0	NA	NA	5.3*

NA = not available.
*Reported value in June 1996.
Sources: U.S. Bureau of the Census, 1983, 1988, and 1994; Otero County Economic Development Council, Inc., 1996.

Table G.2.2-3. Comparison of Wage Rates and Salaries, 1995, All Industries, Otero County

Occupation	Avg Wage	Avg Hr/Wk	Avg Salary	Hourly Low	Hourly High	# of Firms	# of Empl.
Administrative Assistant	$10.92	39.85	$22,600	$4.90	$26.50	61	80
Bookkeeper	$9.31	39.02	$18,900	$4.77	$28.56	114	144
Clerk, Accounting	$8.53	38.49	$17,100	$4.61	$17.12	135	255
Clerk, Desk	$5.40	37.11	$10,400	$4.51	$6.36	18	92
Clerk, File	$6.64	36.10	$12,500	$4.51	$10.81	40	68
Clerk, General	$7.48	38.01	$14,800	$4.51	$12.85	78	204
Clerk, Medical Insurance	$7.85	39.92	$16,300	$6.46	$9.94	12	18
Data Entry Keyer	$6.91	37.75	$13,600	$5.30	$8.30	8	16
Dispatcher	$9.66	52.00	$26,100	$7.16	$11.66	5	13
Receptionist	$6.88	38.42	$13,700	$4.51	$15.08	85	116
Secretary	$8.10	39.19	$16,500	$4.57	$16.30	57	153
Secretary, Executive	$10.99	39.82	$22,800	$6.63	$17.84	41	49
Shipping/Receiving Clerk	$7.05	38.41	$14,100	$4.77	$14.84	22	44
Stock Clerk	$7.73	39.05	$15,700	$4.51	$11.66	29	182
Typist	$7.81	36.89	$15,000	$5.04	$9.67	9	14
Word Processor	$8.99	39.64	$18,500	$4.51	$13.78	14	19
CLERICAL TOTAL	***$8.05***	***38.66***	***$16,200***	***$4.72***	***$15.88***		***1,467***
Accountant	$15.36	40.00	$31,900	$9.42	$20.97	7	8
Financial Manager	$20.88	42.38	$46,000	$6.12	$44.65	57	60
Manager, Office	$12.05	42.09	$26,400	$5.83	$29.55	104	121
Mechanical Engineer	$19.69	40.00	$41,000	$16.83	$28.03	4	6
Nurse, Registered	$15.53	37.60	$30,400	$11.66	$23.85	23	551
Personnel Manager	$14.95	41.01	$31,900	$6.10	$31.80	53	58
Purchasing Manager	$12.35	42.86	$27,500	$6.74	$25.48	36	47
Writer/Editor	$9.22	39.50	$18,900	$6.89	$16.30	4	20
PROF/MANG TOTAL	***$15.09***	***39.15***	***$30,700***	***$9.74***	***$26.52***		***871***
Child Care Worker	$5.08	33.10	$8,700	$4.51	$6.89	5	41
Computer Operator	$7.58	40.00	$15,800	$4.93	$8.56	7	11
Construction Laborer	$8.28	42.53	$18,300	$5.83	$10.71	19	330
Delivery/Route Driver	$8.48	46.14	$20,300	$5.83	$12.24	14	54
Derrick Operator	$9.37	50.36	$24,500	$4.77	$12.16	11	114
Drafter	$11.97	40.00	$24,900	$10.60	$16.96	5	21
Forklift Operator	$7.27	43.50	$16,400	$5.30	$8.85	8	16
Gardener/Groundskeeper	$5.00	38.20	$9,900	$4.51	$5.30	5	9
Heavy Equipment Operator	$11.50	43.67	$26,100	$7.42	$15.94	21	178
Illustrator/Graphic Artist	$6.91	32.33	$11,600	$5.30	$7.42	3	6
Machinery Mechanic	$14.29	48.26	$35,900	$7.16	$23.07	23	228
Machinist	$11.62	40.50	$24,500	$7.95	$13.78	5	26
Maintenance Repairer, General	$6.64	36.22	$12,500	$4.51	$14.15	30	65
Printing Press Operator, Large	$8.07	48.07	$20,200	$6.89	$10.25	4	9
Printing Worker, PrePress	$7.05	40.00	$14,700	$5.30	$9.28	3	5
Security Guard	$5.69	31.40	$9,300	$5.30	$6.36	5	33
Sheet Metal Worker	$10.06	38.83	$20,300	$6.89	$18.37	6	27
Truck Driver, Light	$7.29	48.90	$18,500	$5.30	$9.54	10	22
Truck Driver, Tractor Trailer	$9.07	51.55	$24,300	$7.42	$10.07	11	127
Truck Mechanic	$11.06	48.65	$28,000	$8.15	$18.02	17	52
Welder	$11.64	44.04	$26,700	$6.36	$19.55	13	86
SKILLED/SEMI-SKILLED TOTAL	***$9.93***	***44.51***	***$23,300***	***$6.39***	***$14.30***		***1460***
TOTAL	***$10.39***	***41.02***	***$22,300***	***$6.51***	***$17.71***		***3,798***

Source: Otero County Economic Development Council, Inc., 1996; Southeastern New Mexico Small Employer Wage Survey, August-September, 1995.

Table G.2.2-4. Selected Income Statistics, 1989, by Region

Income Characteristic	Alamogordo	Otero	ROI	New Mexico	Texas	United States
Median household income ($/year)	$24,579	$22,624	$22,496	$24,087	$27,016	$30,056
Share of households with income < $15,000	25.6%	28.3%	33.0%	31.2%	27.6%	24.3%
$15,000 to $24,999	25.2%	26.5%	21.9%	20.5%	18.8%	17.5%
$25,000 to $34,999	18.0%	17.6%	16.1%	16.3%	15.8%	15.8%
$35,000 to $49,999	16.4%	14.6%	14.3%	15.4%	16.6%	17.9%
$50,000 to $74,999	11.8%	10.0%	10.0%	11.0%	13.3%	15.0%
$75,000+	3.1%	3.0%	4.7%	5.6%	8.0%	9.5%
Per capita income ($/year)	$11,255	$10,053	$ 9,246	$11,246	$12,904	$14,420
Population below poverty level (%)	13.5%	16.7%	26.1%	20.6%	18.1%	13.1%

Source: U.S. Bureau of the Census, 1994.

influence of the availability of higher-than-average paying jobs at Holloman AFB. However, Alamogordo's median household income was only 81.78 percent of the national average median household income in 1994. Compared with Otero and the ROI, Alamogordo has the lowest share of the population living on incomes below the poverty level. Alamogordo's share below the poverty line is 13.5 percent (only slightly higher than the U.S. value) compared to 16.7 percent in Otero and 26.1 percent for the ROI.

G.2.3 Housing

Table G.2.3-1 shows the trends in the number of housing units between 1980 and 1990 by occupancy status for Otero County and the ROI, and compares them to trends for New Mexico and Texas. The number of housing units increased at an average annual rate of 2.66 percent for the ROI over the decade, which was faster than the growth in both Texas (2.36 percent) and New Mexico (2.22 percent). Housing grew at 2.58 percent in Otero County over the decade. For the ROI, New Mexico, and Texas, the number of renter-occupied units grew at a faster rate than the number of owner-occupied units. However, the number of owner-occupied units grew at a faster rate in Otero County, averaging 2.44 percent, than the number of renter-occupied units, which increased by only 1.81 percent per year.

The distribution of the housing stock by type of structure in 1990 is reported in Table 3.9-6. The majority of the ROI's housing units are single-family structures (165,589 units or 63.74 percent), followed by multifamily units (65,221 units or 25.10 percent), and mobile homes (28988 units or 11.16 percent). In contrast, Otero County has a much smaller share of multifamily units (2,152 units or 9.29 percent) and a much larger share of mobile homes (6,104 units or 26.34 percent). Housing vacancy rates were relatively high in Otero County in 1990 at 21.7 percent, higher than the other two counties in the ROI (which were only 8.4 percent for Dõna Anna and 4.9 percent for El Paso) and also higher than the state-level averages (which were 14.1 percent for New Mexico and 13.4 percent for Texas).

Table G.2.3-2 summarizes the estimated total number of suitable housing units located within an hour's drive of Holloman AFB. The civilian housing stock is estimated to have grown at an average annual rate of 1.09 percent from 1990 to 1995; this growth is expected to increase slightly from 1995 to 2000 to an average annual rate of 1.11 percent. On-base housing is expected to decline by the year 2000, reflecting the scheduled demolition of several of the older dormitory buildings.

G.2.4 Education

Table G.2.4-1 shows fall enrollments in the school district for 1996. Table G.2.4-2 reports FY95 revenues and expenditures for the Alamogordo Municipal School District.

Table G.2.3-1. Trends in the Number of Housing Units by Occupancy Status

	Total housing units			Total occupied units			Owner-occupied units			Renter-occupied units		
Region	1980	1990	% Cng	1980	1990	% Cng	1980	1990	% Cng	1980	1990	% Cng
New Mexico	507,513	632,058	2.22%	441,466	542,709	2.09%	300,570	365,913	1.99%	140,896	176,796	2.30%
Texas	5,549,352	7,008,999	2.36%	4,929,267	6,070,937	2.11%	3,169,512	3,695,184	1.55%	1,759,755	2,375,753	3.05%
ROI (3 counties)	199,869	259,798	2.66%	185,816	241,550	2.66%	112,077	144,955	2.61%	73,739	96,595	2.74%
Otero County	17,961	23,177	2.58%	14,608	18,155	2.20%	8,897	11,322	2.44%	5,711	6,833	1.81%
Dõna Ana County	33,944	49,148	3.77%	30,402	45,029	4.01%	19,494	29,084	4.08%	10,908	15,945	3.87%
El Paso County	147,964	187,473	2.39%	140,806	178,366	2.39%	83,686	104,549	2.25%	57,120	73,817	2.60%

Source: Bureau of the Census 1982b and 1993.

Table G.2.3-2. Summary of Current and Projected Housing Supply for HAFB

Housing Units	Year		
	1990	1995	2000
Off-base housing			
Owner-occupied or "Vacant for Sale" units	11,777	12,481	13,246
Renter-occupied or "Vacant for Rent" units	5,921	6,199	6,497
Total off-base housing units	***17,698***	***18,680***	***19,743***
On-base housing			
Dormitories: permanent party		1,475	1,000
Dormitories: transient		339	339
Military family housing		1,551	1,551
Total on-base housing units		***3,365***	***2,890***
Total housing market area housing		***22,045***	***22,633***

Source: Southwest Land Research, Inc., 1995.

Table G.2.4-1. Alamogordo Municipal School District Fall Enrollments – 1996

Level of school	Number of Schools	Grades	Enrollment
Elementary	11	K-6	4,200
Junior high	1	7-8	992
Middle school	1	7-8	195
High school	1	9-12	2,095
Special	All	All	541
Education Total	14	K-12	8,023

Source: Alamogordo Public Schools, Student Enrollment and Staffing Pattern, September 18, 1996.

Table G.2.4-2. Revenues, Expenditures and Changes in Fund Balances, All Governmental Fund Types, Alamogordo Municipal School District No. 1 (June 30, 1995)

Fund Category	Fund Balance
Revenues	
Local sources	$ 2,895,792
State sources	27,349,801
Federal sources	3,762,853
Total revenues	34,008,446
Expenditures	
Direct instruction	17,431,533
Administration	4,805,685
Business and support services	778,758
Operation/maintenance plant	479,624
Food services	4,115,737
Athletics	1,899,740
Non-instructional student activity	479,651
Community services	598,292
Pupil transportation services	53,586
Capital outlay	1,524,476
Fixed charges	770,728
Debt service/bond principal	200,000
Debt service/interest	451,212
Total expenditures	33,589,022
Excess (deficiency) of revenues over expenditures	419,424
Fund Balance – June 30, 1994	3,393,158
Increase in reserve for inventory	43,856
Fund Balance – June 30, 1995	3,856,438

Source: Alamogordo Municipal School District No. 1, 1995.

G.2.5 Police and Fire Protection

Table G.2.5-1 shows a comparison of crime rates for the different geographic regions surrounding Holloman AFB in 1991.

G.2.6 Public Finance

Table G.2.6-1 presents information on tax receipts for the ROI in comparison with values for New Mexico, Texas, and the U.S. Table G.2.6-2 shows revenues and expenses for Alamogordo and Otero County for the last four years.

G.2.7 Minority and Low-Income Populations

Table G.2.7-1 includes information of the census tract areas having a higher percentage of low-income and minority populations in the overflight areas potentially affected by the proposed beddown than in the ROI as a whole.

G.3 IMPACTS METHODOLOGY

The impacts methodology used to evaluate each of the options under the proposed action was input-output analysis. The Regional Input-Output Modeling System (RIMS II) of the U.S. Bureau of Economic Analysis (BEA) developed for the ROI, in addition to a separate matrix for Otero County was used (BEA, 1996). In this section, the methodology and assumptions used to calculate the impacts on employment, households, and population discussed under each alternative is evaluated.

The estimation of employment impacts due to public and private-sector projects can be conducted effectively through the use of input-output analysis. To systematically evaluate the regional responses to project changes, it is necessary to account for interindustry relationships within regions. The input-output framework is a useful tool for economic impact analysis because its multipliers depend upon the interindustry relationships within regions.

Input-output analysis focuses upon identifying the linkages (inputs purchased and outputs sold) among industries within an economy, and, using these linkages, tracing the impacts of specific changes on detailed sectors of the economy. For example, an industry (say industry "A") purchases outputs from 10 other industries ("B" to "K"). Assume that two of these industries (say industries "B" and "C") purchase inputs from industry "A" (the "direct" effect) would then impact industries "B" and "C" (the "indirect" effect). In an input-output framework, multipliers are available for each industry included in the model, a clear advantage over the other models that often rely upon "aggregate" multipliers for the entire

Table G.2.5-1. Serious Crimes Known to Police, 1991[1]

Region	Number of Serious Crimes	Number of Violent Crimes[2]	Crime Rate[3]
United States	14,161,710	1,837,254	5,928
New Mexico	78,596	9,964	7,029
Texas	1,355,639	145,658	7,821
ROI	64,457	6,836	7,721
Otero County	1,605	88	5,200
Doña Ana County	8,850	756	6,487
El Paso County	54,002	5,992	8,937
Alamogordo	1,533	81	5,437

[1]Data on serious crimes have not been adjusted for underreporting; this may affect comparability among geographic areas.
[2]Includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.
[3]Per 100,000 resident population estimated for 1991 by the Federal Bureau of Investigation.

Source: U.S. Bureau of the Census, 1994.

Table G.2.6-1. Local Government Finances, 1986-1987 (millions of dollars)

Region	Total General Revenues	Intergovern-mental Transfers	Tax Receipts	Share of Tax Receipts	Total Direct Expenses	% of Direct General Expenses
United States	411,584.1	156,263.4	158,293.5	38.46%	392,014.6	95.25%
New Mexico	2,232.8	1,225.0	383.2	17.16%	2,146.7	96.15%
Texas	26,798.8	7,480.8	11,390.1	42.50%	26,061.0	97.25%
ROI	980.5	512.2	236.0	24.07%	977.6	99.70%
Otero	48.2	33.1	7.0	14.52%	49.4	102.49%
Doña Ana	170.4	99.2	23.7	13.91%	182.1	106.87%
El Paso	761.9	379.9	205.3	26.95%	746.1	97.93%
Alamogordo*	14.0	5.8	4.4	31.43%	11.9	85.00%

*Reported for 1990-1991.
Source: U.S. Bureau of the Census, 1994.

Table G.2.6-2. Revenues and Expenses for Alamogordo and Otero County, 1994 to 1996

Region/Category	FY 1994	FY 1995	FY 1996
ALAMOGORDO			
Beginning Cash Balance	23,790,589	16,312,645	10,123,985
Revenues	29,603,373	30,121,259	35,542,683
Expenses	44,630,515	42,155,728	39,086,133
OTERO COUNTY			
Beginning Cash Balance	7,654,922	8,694,200	9,251,522
Revenues	10,733,877	12,144,665	20,039,382
Expenses	9,674,491	11,081,533	13,349,727

Sources: Hooser, personal communication, October 16, 1996; Montgomery, personal communication, October 16, 1996.

Table G.2.7-1. Census Tracts and Block Numbering Areas Underlying Military Airspace
(page 1 of 4)

Census Tract	County	Percent of Area Affected	Total Population	Minority Population	Percent Minority	Population Affected	Minority Population Affected
United States	NA				16.1		
Region of Comparison [b]	NA				51.9		
Census Tracts/Block Numbering Areas in New Mexico							
9761	Catron	67.7	924	250	27.1	626	169
9762	Catron	79.6	1639	505	30.8	1305	402
0011	Chaves	54	6776	2406	35.5	3659	1299
0012	Chaves	28.9	1533	522	34.1	443	151
0014	Chaves	11.4	2149	1203	56.0	245	137
9741	Cibola	3	2967	1686	56.8	89	51
9742	Cibola	37.5	5763	3312	57.5	2161	1242
9743	Cibola	100	2864	2037	71.1	2864	2037
9744	Cibola	34.8	2242	1300	58.0	780	452
9745	Cibola	67.4	1687	945	56.0	1137	637
9746	Cibola	64.2	1852	1693	91.4	1189	1087
9747	Cibola	42.7	2584	2559	99.0	1103	1093
0007	Curry	1.2	1164	124	10.7	14	1
9601	DeBaca	97.1	2028	731	36.0	1969	710
9602	DeBaca	100	224	41	18.3	224	41
0013	Dona Ana	8	15558	8251	53.0	1245	660
0014	Dona Ana	28.2	3849	2878	74.8	1085	812
0015	Dona Ana	1.1	3895	1538	39.5	43	17
0001	Eddy	100	1555	464	29.8	1555	464
0002	Eddy	100	4179	443	10.6	4179	443
0003	Eddy	100	5552	1247	22.5	5552	1247
0004	Eddy	94.1	8391	2992	35.7	7896	2815
0005	Eddy	100	3559	2220	62.4	3559	2220
0006	Eddy	21.9	4784	2648	54.9	1048	576
0007	Eddy	60.4	3868	1165	30.1	2336	704
0009	Eddy	51.1	300	32	10.7	153	16
0010	Eddy	34.4	5609	3306	58.9	1929	1137
0011	Eddy	68.3	5932	1467	24.7	4052	1002
0012	Eddy	57.7	3025	1115	36.9	1745	643
0008	Eddy	96.1	1851	1290	69.7	1779	1240
9841	Grant	40.3	958	145	15.1	386	58
9846	Grant	49.9	3665	2962	80.8	1829	1478
9849	Grant	88.6	1096	452	41.2	971	400
9617	Guadalupe	78.2	741	634	85.6	579	496
9619	Guadalupe	100	377	257	68.2	377	257
9616	Guadalupe	77.1	2509	2181	86.9	1934	1682
9618	Guadalupe	100	529	487	92.1	529	487
9801	Lincoln	66.4	524	144	27.5	348	96
9802	Lincoln	81.4	1260	659	52.3	1026	536
9803	Lincoln	87.3	2223	595	26.8	1941	519
9804	Lincoln	77.6	889	634	71.3	690	492
9805	Lincoln	97.9	995	150	15.1	974	147
9806	Lincoln	100	2419	426	17.6	2419	426
9807	Lincoln	100	1080	204	18.9	1080	204
9808	Lincoln	100	1558	327	21.0	1558	327
9809	Lincoln	100	1271	495	38.9	1271	495
9861	Luna	28.5	1602	623	38.9	457	178
0008	Otero	0.3	2695	2615	97.0	8	8
0009	Otero	7.3	5073	1454	28.7	370	106
000603	Otero	80.8	2302	593	25.8	1860	479
0007	Otero	58.9	4755	2044	43.0	2801	1204
9586	Quay	3.1	7579	3719	49.1	235	115
9588	Quay	60.2	1471	254	17.3	886	153
9593	Roosevelt	15.5	1215	179	14.7	188	28

Table G.2.7-1. Census Tracts and Block Numbering Areas Underlying Military Airspace
(page 2 of 4)

Census Tract	County	Total Families	Families Living in Poverty [a]	Percent Low Income	Families Affected	Poverty Families Affected
United States	NA			13.5		
Region of Comparison [b]	NA			21.0		
Census Tracts/Block Numbering Areas in New Mexico						
9761	Catron	304	54	17.8	206	37
9762	Catron	480	99	20.6	382	79
0011	Chaves	1738	364	20.9	939	197
0012	Chaves	437	68	15.6	126	20
0014	Chaves	573	169	29.5	65	19
9741	Cibola	650	131	20.2	20	4
9742	Cibola	1513	402	26.6	567	151
9743	Cibola	748	155	20.7	748	155
9744	Cibola	552	148	26.8	192	52
9745	Cibola	481	135	28.1	324	91
9746	Cibola	391	232	59.3	251	149
9747	Cibola	533	258	48.4	228	110
0007	Curry	337	35	10.4	4	0
9601	DeBaca	587	115	19.6	570	112
9602	DeBaca	64	9	14.1	64	9
0013	Dona Ana	4111	673	16.4	329	54
0014	Dona Ana	951	328	34.5	268	92
0015	Dona Ana	963	101	10.5	11	1
0001	Eddy	421	30	7.1	421	30
0002	Eddy	1211	61	5.0	1211	61
0003	Eddy	1507	194	12.9	1507	194
0004	Eddy	2314	423	18.3	2177	398
0005	Eddy	937	273	29.1	937	273
0006	Eddy	1220	238	19.5	267	52
0007	Eddy	995	128	12.9	601	77
0009	Eddy	99	4	4.0	249	47
0010	Eddy	1472	365	24.8	34	1
0011	Eddy	1768	149	8.4	1005	249
0012	Eddy	905	206	22.8	1020	86
0008	Eddy	487	91	18.7	870	198
9841	Grant	271	49	18.1	109	20
9846	Grant	944	234	24.8	471	117
9849	Grant	294	23	7.8	260	20
9617	Guadalupe	216	76	35.2	534	168
9619	Guadalupe	113	63	55.8	216	76
9616	Guadalupe	683	215	31.5	114	55
9618	Guadalupe	148	71	48.0	113	63
9801	Lincoln	148	38	25.7	98	25
9802	Lincoln	354	65	18.4	288	53
9803	Lincoln	553	48	8.7	483	42
9804	Lincoln	258	82	31.8	200	64
9805	Lincoln	329	41	12.5	322	40
9806	Lincoln	725	75	10.3	725	75
9807	Lincoln	332	38	11.4	332	38
9808	Lincoln	408	92	22.5	408	92
9809	Lincoln	335	79	23.6	335	79
9861	Luna	435	125	28.7	124	36
0008	Otero	579	262	45.3	2	0
0009	Otero	1395	253	18.1	93	18
000603	Otero	593	49	8.3	468	212
0007	Otero	1277	243	19.0	822	149
9586	Quay	2176	545	25.0	67	17
9588	Quay	480	67	14.0	289	40
9593	Roosevelt	344	47	13.7	53	7

Table G.2.7-1. Census Tracts and Block Numbering Areas Underlying Military Airspace
(page 3 of 4)

Census Tract	County	Percent of Area Affected	Total Population	Minority Population	Percent Minority	Population Affected	Minority Population Affected
Census Tracts/Block Numbering Areas in New Mexico							
9821	Sierra	57.8	1252	185	14.8	724	107
9822	Sierra	100	3408	910	26.7	3408	910
9823	Sierra	100	3310	735	22.2	3310	735
9824	Sierra	100	1942	663	34.1	1942	663
9780	Socorro	55.8	122	41	33.6	68	23
9781	Socorro	61.9	2474	1403	56.7	1531	868
9782	Socorro	81.5	2804	2085	74.4	2285	1699
9783	Socorro	56.6	9167	5164	56.3	5189	2923
9784	Socorro	86.7	197	99	50.3	171	86
9631	Torrance	80.7	536	300	56.0	433	242
9632	Torrance	6.7	8031	2894	36.0	538	194
9633	Torrance	85	1718	867	50.5	1460	737
9711	Valencia	20	593	299	50.4	119	60
Census Tracts/Block Numbering Areas in Texas							
9501	Brewster	25.8	725	6407	56.1	187	105
9502	Brewster	24	1915	674	35.2	460	162
9501	Culberson	59.9	317	149	47.0	190	89
9501	Hudspeth	52.6	2023	1417	70.0	1064	745
9502	Hudspeth	63	892	542	60.8	562	341
9501	Jeff Davis	41.1	1946	792	40.7	800	326
9505	Pecos	27.7	3217	1748	54.3	891	484
9501	Presidio	38.7	3155	2156	68.3	1221	834
9502	Presidio	13.5	3482	3284	94.3	470	443
9505	Reeves	3.7	1655	1332	80.5	61	49
Census Tracts/Block Numbering Areas in Arizona							
9702	Apache	1.4	2393	397	16.6	34	6
9703	Apache	31.5	2398	765	31.9	755	241
9704	Apache	52.1	1030	83	8.1	537	43
9705	Apache	26.2	6257	1304	20.8	1639	342
9901	Greenlee	64	1371	695	50.7	877	445

Notes: a Low income is measured by identifying the number of families below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

b The Region of Comparison is comprised of 27 counties in New Mexico, Texas, and Arizona.

Source: U.S. Bureau of the Census 1991.

Table G.2.7-1. Census Tracts and Block Numbering Areas Underlying Military Airspace
(page 4 of 4)

Census Tract	County	Total Families	Families Living in Poverty [a]	Percent Low Income	Families Affected	Poverty Families Affected
Census Tracts/Block Numbering Areas in New Mexico						
9821	Sierra	432	30	6.9	250	17
9822	Sierra	991	147	14.8	991	147
9823	Sierra	883	129	14.6	883	129
9824	Sierra	577	77	13.3	577	77
9780	Socorro	27	0	0.0	15	0
9781	Socorro	652	159	24.4	404	98
9782	Socorro	681	217	31.9	555	177
9783	Socorro	2401	511	21.3	1359	289
9784	Socorro	38	20	52.6	33	17
9631	Torrance	168	37	22.0	136	30
9632	Torrance	2173	358	16.5	146	24
9633	Torrance	457	120	26.3	388	102
9711	Valencia	178	34	19.1	36	7
Census Tracts/Block Numbering Areas in Texas						
9501	Brewster	183	37	20.2	47	10
9502	Brewster	528	120	22.7	127	29
9501	Culberson	109	10	9.2	65	6
9501	Hudspeth	535	205	38.3	281	108
9502	Hudspeth	213	37	17.4	134	23
9501	Jeff Davis	533	80	15.0	219	33
9505	Pecos	817	230	28.2	226	64
9501	Presidio	889	221	24.9	344	86
9502	Presidio	868	486	56.0	117	66
9505	Reeves	432	145	33.6	16	5
Census Tracts/Block Numbering Areas in Arizona						
9702	Apache	620	57	9.2	9	0
9703	Apache	601	67	11.1	189	21
9704	Apache	355	0	0.0	185	0
9705	Apache	1395	205	12.1	444	54
9901	Greenlee	351	69	19.7	225	44

Notes: a Low income is measured by identifying the number of families below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

b The Region of Comparison is comprised of 27 counties in New Mexico, Texas, and Arizona.

Source: U.S. Bureau of the Census 1991.

economy. A national input-output model has been estimated by the BEA. The latest national input-output matrix reflects technical relationships in place in 1987.

Converting the national model to a regional (county level) model requires a process referred to as "regionalizing" the coefficients. This means that the national input-output coefficients must be adjusted to more accurately reflect the economic structure of the region being analyzed. In the early 1970s, BEA adopted a specific method for regionalizing the national model based on a shortcut method of estimating regional multipliers without requiring detailed regional surveys. This model was called RIMS. In the early 1980s, the method for regionalizing the national coefficients was significantly revised, allowing for a more complete matrix of direct and indirect coefficients to be estimated. This new procedure used county-level employment and earnings data from BEA and allowed regional input-output matrices to be updated as new employment and earnings data become available. Because it relies on county-level data, a RIMS II model can be developed for any county or multiple-county region in the U.S.

The regionalization process begins with the national table of direct coefficients. This table contains the input and output relationships between industries in the U.S. and reflects the technology used in each industry. Because not all industries exist in each county, the process of regionalization must account for the absence of some industries from the region. The process of identifying industries that do not exist in the study region uses BEA's county-level employment and earnings data. The strategy is to multiply regional location quotients and national coefficients to estimate regional technological relationships. A household section is estimated to capture the economic interrelationships in the regional economy resulting from increases in personal income. The end result of this process is a matrix of coefficients that recognizes the structure of the regional economy and its interindustry transactions. The transactions table is manipulated to estimate the matrix of total requirements (the sum of the indirect and induced effects of a change in final local demand of $1) for output, employment, and earnings.

Tests of the reliability of RIMS II estimates were conducted by BEA to determine the technique's relative accuracy. The standard for testing compared the coefficients determined by survey-based input-output models for regions in Washington, Texas, and West Virginia. In these states, the RIMS II multipliers tended to overstate the survey-based estimates by less than 10 percent. RIMS II-based impact analysis has been conducted for a number of studies, including Department of Defense Environmental Impact Statements of military base realignments, evaluations of effects of increasing expenditures by tourists, and the results of a new factory locating in a state (Regional Economic Analysis Division, 1981 and 1992).

Table G.3-1 presents a column for each region showing estimated typical employment multipliers, which are defined as the ratio of total employment effects (including direct, indirect and induced employment associated with a change) to direct employment. Each typical employment multiplier is estimated based on the

Table G.3-1. Estimated Employment Multipliers by Industry and Region

	Otero County			ROI		
Industry	Regional Share (1)	BEA Jobs/Mil$ Output (2)	Estimated Typical Employment Multiplier (3) (Total Jobs/ Direct Jobs)	Regional Share (1)	BEA Jobs/Mil$ Output (2)	Estimated Typical Employment Multiplier (3) (Total Jobs/ Direct Jobs)
Construction (6)	47.72%	11.8	1.5	62.48%	16.4	1.9
Utilities (27)	43.98%	7.5	1.4	55.49%	7.1	1.5
Business Services (35)	38.60%	29.7	1.9	60.20%	33.8	2.6
Health Care Services (37)	48.97%	26.0	2.0	63.63%	29.8	2.5
Households (39)	42.90%	10.7	1.4	63.07%	16.1	1.9

(1) Represents the amount of each $ spent in the region going to businesses in the industry sector located in the region. Estimated from the underlying transactions matrix calculated by inverting the RIMS II output multiplier matrix.
(2) Calculated from RIMS II employment multiplier matrix.
(3) Estimated by assuming that the number of direct jobs = $1million/(3 x average salary in industry sector) = D; and that the total number of jobs is equal to T = D + (regional share) x (BEA jobs/million $ output)).

Source: SAIC calculations and U.S. BEA, 1996c.

assumption that disposable wages account for one-third of project expenditures and that average wages for the project are equal to the average industry wage reported for the region. Depending on the actual relationship of labor costs to total costs, the estimated employment multiplier for any particular project will tend to be slightly different from the "typical" employment multipliers shown in the table. Estimated typical employment multipliers vary from 1.4 to 2.0 for Otero County and from 1.5 to 2.6 for the ROI.

A regional input-output model is under development by New Mexico State University (NMSU) to estimate state and regional economic activities. This model projects the opportunity costs of changes in animal unit months (AUMs). The NMSU Department of Agricultural Economics and Agricultural Business has completed an input-output model for the state of New Mexico and Chaves County, in cooperation with the University of Wyoming and the University of Nevada Cooperative Extension Service. The original University of Wyoming model was adapted from Micro IMPLAN tables, a widely used national model. At NMSU, the model was customized using New Mexico data to adequately define spending patterns of New Mexico industries. The agriculture industries were expanded to include all major crops produced in the state and provide a more detailed description of agriculture in the model. The Otero County input-output model is under development. The state and the Chaves County models were used to estimate a range of impacts associated with removing cattle from McGregor Range for the proposed new target complex on the Otero Mesa. The estimated agriculture employment multiplier from the NMSU county-level model was 1.4 total jobs to direct jobs. The comparable value for the state of New Mexico was 1.9 (Fowler, 1997).

The impact calculations made using the input-output results are as follows. For example, in 1997 it is estimated that there would be $2.4 million spent for construction, with direct employment of 21 people. From Table G.3-1, total regional share dollars received by Otero County businesses would be 47.72% of $2.4 million or 1.15 million. Secondary jobs are calculated by multiplying the 1.15 million times the jobs/million dollar output (11.8) to produce 13.6 secondary jobs. Therefore, the total number of jobs in 1997 associated with project construction in Otero County would be 34.6 (21 + 13.6).

The impact calculations made using the estimated typical employment multiplier are as follows. The 1997 direct construction estimate of 21 employees is multiplied by the employment multiplier of 1.5 from Table G.3-1. This produces a total number of 71 × 1.5 or 31.5 jobs in 1997 associated with the project construction.

For environmental impact analysis, the higher estimated number of 34.6 jobs from the BEA regional share calculations were used.

G.4 ESTIMATED IMPACTS IN THE ROI AND OTERO COUNTY

This section describes the assumptions and calculations used to estimate impacts in the ROI and Otero County for each of the options under the proposed action. The first step in the analysis was to examine how employment and expenditure levels are expected to change under each option. These estimates were developed based upon the construction plans and forecasted military [U.S. Air Force (USAF) and German Airforce (GAF)] manpower requirements. In the second step, RIMS II employment matrices were used to estimate the levels of induced employment associated with each of the alternatives for both Otero County and the ROI. Finally, assumptions regarding in-migration, reduction in the unemployment rate, and average household size were used to derive estimates of the anticipated changes in the number of households and population.

The personnel changes at Holloman AFB and the on-base construction activities planned under the Planned Action are included as part of all of the alternative configurations of the action, no matter what assumptions are made considering the development of a bombing range. The differences in the options discussed in Section 4.9 center around the use of airspace. For socioeconomic impacts, these options vary in the amount of construction employment that would be required in 1998 and 1999 in preparation for the GAF personnel that would come into the area in 1999 and 2000. Under the Existing Range option, bombing ranges that are currently being used by U.S. and GAF military personnel would be used more extensively for training purposes. The West Otero Mesa option includes the allocation of approximately $10 million to create a bombing range on the Otero Mesa. Approximately $20 million is included in the Tularosa Basin option for the development of a range in the Tularosa Basin area, including needed road improvements.

G.4.1 Construction Activities

The differences in the expenditures for the three options can be attributed to differences in the cost of range construction. Under the West Otero Mesa option, the estimated cost for range construction is approximately $10 million. The cost of range construction under the Tularosa Basin option is more than double the West Otero Mesa option estimate, at more than $20 million. As the name of the option indicates, there would be no expenditure for range construction under the Existing Range option. Total construction activity is projected to be completed by the year 2000 under each option, at a total cost of over $100 million.

Table G.4.1-1 shows the derivation of estimates of the number of construction workers required under each option. Under these assumptions, it is estimated that the Existing Range option would require 21 construction workers in 1997, 336 in 1998, 441 in 1999, and 110 in 2000, when all construction activity would

Table G.4.1-1. Estimated Construction Employment for the Proposed Action, 1997 to 2000

Cost/Employment ($ Mil/# Jobs)	1997	1998	1999	2000
No NTC Option				
Total Construction Expenditures	2.4	39.2	51.4	12.8
Estimated # of Jobs	21	336	441	110
West Otero Mesa Option				
Total Construction Expenditures	2.4	47.2	52.6	12.8
Estimated # of Jobs	21	405	451	110
Tularosa Basin Option				
Total Construction Expenditures	2.4	57	54.0	12.8
Estimated # of Jobs	21	489	463	110

Source: Holloman AFB, 1997, and SAIC calculations.

Note: The estimated dollar values were developed based upon the specific construction projects included in each option. The distribution by year was based on the schedule available and assumes that expenditures would be spread out over the entire construction period.

be completed. The table also shows the estimated number of workers required each year under the other two options.

GAF personnel changes associated with the proposed action would be expected to begin in 1999 and be completed in the year 2000. Under all three options, construction employment is estimated to be 110 FTEs in 2000. When construction jobs are added to the increase of 640 GAF personnel in 2000, the maximum direct personnel change associated with the proposed action is projected to occur in the year 2000 for all of the options. The next largest change is anticipated to occur in 1998 when construction employment is estimated to vary between 336 and 489 depending upon the option. The estimated impacts for 2000 represent the upperbound on anticipated changes associated with the proposed action. Therefore, impacts for 1997 through 1999 would be lower, requiring smaller adjustments than those examined in detail for the year 2000.

G.4.2 Manpower Changes

Table G.4.2-1 summarizes the personnel changes at Holloman AFB and direct construction as a result of the proposed action. Reductions in U.S. military and civilian staffing are expected to occur by the year 2000 as a result of anticipated adjustments already approved for the base. By the year 2001, all construction will have been completed under the proposed action, GAF personnel are expected to number 990, and U.S. military and civilian personnel are projected to number 5,290.

G.4.3 Adjustments to Annual Expenditures

Changes in staffing at Holloman AFB are expected to change expenditures in two ways: adjustments to the salary budget and modifications of base-level expenditure categories that can be related to base population levels.

In 1996, expenditures on USAF military salaries at Holloman AFB totaled more than $144 million. Assuming a representative military strength of 4,610 in 1996, the average military salary was $31,232. Appropriated civilian salaries were estimated to average $26,801 in 1996 (expenditures of $25.3 million for an estimated 944 employees). GAF personnel (both military and civilian) are estimated to receive the average earnings (including special allowances) estimated for 1996 of $58,000 (Valdez, 1996; Olesen, 1996).

Categories of expenses that are assumed to fluctuate with staffing levels are medical support, operations and maintenance (O&M) expenditures, utilities, and business services. Medical support is provided to all military personnel (both USAF and GAF). Total expenditures for medical services were estimated to average $1,426 in 1996 ($7 million for 4,910 military). Utilities averaged $876 per person working at the base ($5,168,349 for 5,899 employees, including USAF and GAF military and civilian personnel). O&M averaged $1,609 in 1996 (Valdez, 1996).

Table G.4.2-1. Changes to Military, Civilian, and Construction Employment Due to Proposed Action

	Existing Conditions (96//3)	Known Changes to Existing Conditions	Projected Baseline FY00	Changes Due to Proposed Action	Conditions Under Proposed Action, FY00	Changes in FY01 with Completed Construction	Conditions Under Proposed Action, FY01
U.S. Military/ Civilian	5,550	(260)	5,290	0	5,290	0	5,290
GAF Military/ Civilian	350	0	350	640	990	0	990
Proposed Action Construction	0	0	0	110	110	(110)	0
Total Direct Employment	5,900	(260)	5,640	750	6,390	(110)	6,280

Source: Table 2.1-2 and SAIC calculations.

In 1996, contracting expenditures totaled $50.7 million. Of that total, approximately $12.2 million involved business services. Based on expenditure levels in 1996, approximately 15.8 percent of the base's expenditures were to businesses located in Otero County, 12.6 percent went to Las Cruces, and 32.2 percent went to El Paso. Using these figures, it was estimated that per capita expenditures for business services were $326 in Otero County and $1,250 for the ROI (Valdez, 1996; Groth, 1996).

G.4.4 Final Demand Changes

Table G.4.4-1 shows the estimated annual changes in expenditure levels in the ROI associated with the proposed action given the estimates of construction expenditures, salaries, per capita expenditures at the base, and direct employment changes (all previously discussed). Table G.4.4-2 shows the changes in expenditure levels in Otero County. The differences between the two tables are shown in the business services row, reflecting the higher value of per capita expenditures in the ROI. The columns presented in the tables represent the industry categories that correspond with those available in RIMS II.

Table G.4.4-3 shows the results of the NMSU input-output model assessment for the withdrawal of AUMs under the West Otero Mesa option. The format for this table is consistent with the format in Tables G.4.4-1 and G.4.4-2 so that direct associations can be made for the estimated direct changes assumed for activities at Holloman AFB and the changes in agricultural activity estimated for McGregor Range.

Two simulation results are presented in Table G.4.4-3. The first reflects the expected reduction of 425 AUMs. The second has assumed substantially reduced AUMs in the target safety area for grazing units 9 and 13. There is no proposal to reduce AUMs in these units outside the safety area, and the U.S. Air Force regularly leases western land for grazing in range safety areas, including the State of New Mexico, and the land in these safety areas is regularly sought by cattle ranching operations.

G.4.5 Employment Impacts

Secondary employment for each industry change is calculated as the product of the change in expenditures, the regional share, and the employment multiplier. These calculations are made for each of the two regions. Tables G.4.5-1 and G.4.5-2 show the total estimated indirect employment derived from the use of the RIMS II parameters and the expenditure changes estimated for each alternative. For comparison, the forecasted changes in the number of households and population are also shown on these tables. Calculation of those values is explained in the next section.

Table G.4.4-1. Estimated Annual Final Demand Vectors for Proposed Action for ROI

Economic Sector/ Employment (Mil$/# People)	Existing Conditions (96//3)	Known Changes to Existing Conditions	Projected Baseline FY00	Changes Due to Proposed Action	Conditons Under Proposed Action FY00	Changes in FY01 with Completed Construction	Conditons Under Proposed Action FY01
Construction	9.4	(0.4)	9.0	9.9	18.9	(9.0)	9.9
Utilities	5.1	(0.2)	4.9	0.5	5.4	0.0	5.4
Health Care Services	7.0	(0.3)	6.7	0.7	7.4	0.0	7.4
Business Services	7.3	(0.3)	7.0	0.8	7.8	0.0	7.8
Households	188.5	(7.9)	180.6	40.0	220.6	(3.8)	216.8
Total	217.3	(9.1)	208.2	51.9	260.1	(12.8)	247.3
Direct Employment	5,900	(260)	5,640	750	6,390	(110)	6,280

Source: SAIC calculations.

Note: This table summarizes the direct changes expected in the years 1997-2001 and summarizes the changes relative to the expenditure levels and employment at Holloman AFB.

Table G.4.4-2. Estimated Annual Final Demand Vectors for Proposed Action for Otero County

Economic Sector/ Employment (Mil$/# People)	Existing Conditions (96//3)	Known Changes to Existing Conditions	Projected Baseline FY00	Changes Due to Proposed Action	Conditons Under Proposed Action FY00	Changes in FY01 with Completed Construction	Conditons Under Proposed Action FY01
Construction	9.4	(0.4)	9.0	9.9	18.9	(9.0)	9.9
Utilities	5.2	(0.2)	5.0	0.5	5.5	0.0	5.5
Health Care Services	7.1	(0.3)	6.8	0.7	7.5	0.0	7.5
Business Services	1.9	(0.1)	1.8	0.2	2.0	0.0	2.0
Households	160.7	(7.0)	153.7	19.7	173.4	(3.8)	169.6
Total	184.3	(8.0)	176.3	31.0	207.3	(12.8)	194.5
Direct Employment	5,900	(260)	5,640	750	6,390	(110)	6,280

Source: SAIC calculations.

Note: This table summarizes the direct changes expected in the years 1997-2001 and summarizes the changes relative to the expenditure levels and employment at Holloman AFB.

Table G.4.4-3. Estimated Changes in AUMs, Cattle-Related Income, Range Economic Activity, and Range Employment in Otero County Under the West Otero Mesa Option

Change Category	Existing Conditions (96//3)	Known Changes to Existing Conditions	Projected Baseline FY00	Changes Due to Proposed Action	Conditons Under Proposed Action FY00	Changes in FY01 with Completed Construction	Conditons Under Proposed Action FY01
Most Likely Assumptions:							
AUMs	11,703	0	11,703	(425)	11,278	0	11,278
Cattle-Related Income	268,756*	0	268,756	(9,760)	258,996	0	258,996
Range Economic Activity	1,046,992**	0	1,046,992	(38,022)	1,008,970	0	1,008,970
Range Employment	14.59***	0	14.59	(0.53)	14.06	0.00	14.06
Maximum Impact Assumptions							
AUMs	11,703	0	11,703	(2,181)	9,522	0	9,522
Cattle-Related Income	268,756*	0	268,756	(50,087)	218,669	0	218,669
Range Economic Activity	1,046,992**	0	1,046,992	(157,280)	889,712	0	889,712
Range Employment	14.59***	0	14.59	(2.74)	11.85	0.00	11.85

* Estimated by assuming that income of $9,760 is produced by 425 AUMS.
** Estimated by assuming that economic activity of $38,022 is produced by 425 AUMS.
*** Estimated by assuming that 425 AUMS represent employment of 0.53 FTEs.

Source: Fowler, 1997a; 1997b. Based on NMSU I-O Model for Chaves County, New Mexico.

Table G.4.5-1. Employment, Housing, and Population Changes in the ROI Due to the Proposed Action

Employment, Households, and Population	Existing Conditions (96//3)	Known Changes to Existing Conditions	Projected Baseline FY00	Changes Due to Proposed Action in FY00	Conditons Under Proposed Action FY00	Changes in FY01 with Completed Construction	Conditons Under Proposed Action FY01
Direct Employment (FTE)	5,900	(260)	5,640	750	6,390	(110)	6,280
Indirect Employment (FTE)	2,198	(93)	2,105	549	2,654	(169)	2,485
Total Employment (FTE)	8,098	(353)	7,745	1,299	9,044	(279)	8,765
Number of Households (# Units)	6,132	(263)	5,869	743	6,612	(229)	6,383
Population (# People)	18,147	(777)	17,370	2,134	19,504	(560)	18,944

Source: SAIC calculations based on RIMS II simulations and associated relationships between employment and households and population.

Table G.4.5-2. Employment, Housing, and Population Changes in Otero County Due to the Proposed Action

Employment, Households, and Population	Existing Conditions (96//3)	Known Changes to Existing Conditions	Projected Baseline FY00	Changes Due to Proposed Action in FY00	Conditons Under Proposed Action FY00	Changes in FY01 with Completed Construction	Conditons Under Proposed Action FY01
Direct Employment (FTE)	5,900	(260)	5,640	750	6,390	(110)	6,280
Indirect Employment (FTE)	909	(39)	870	197	1,067	(107)	960
Total Employment (FTE)	6,809	(299)	6,510	947	7,457	(217)	7,240
Number of Households (# Units)	5,170	(223)	4,947	743	5,690	(103)	5,587
Population (# People)	14,749	(636)	14,113	1,814	15,927	(251)	15,676

Source: SAIC calculations based on RIMS II simulations and associated relationships between employment and households and population.

G.4.6 Impacts to Housing and Population

Estimated values for households and population were calculated for each region based on the total estimated employment derived from RIMS II. It was assumed that some secondary jobs can be filled by the unemployed labor pool from Otero County; up to one percent of the total number of people employed was assumed to be available to meet secondary labor demand. With the current unemployment rate in the county at 8 percent, this assumption is conservative. Each GAF employee is assumed to be the only wage earner in the family. German spouses do not currently have an immigration status that allows them to work in the U.S. All other employees are assumed to have the U.S. average of 1.34 jobs per household. For U.S. military and civilian households and secondary employment households located in Otero County, it is assumed that the average household size is 2.85 persons (the reported value in 1990). It is assumed that GAF households have an average of 2.6 persons per household. Many of the GAF personnel will be young pilots who are expected to come to Holloman AFB with their families.

Estimates of the population accompanying construction workers are handled differently based on the observation that a large portion of the construction labor force is transient; not all construction workers move their family to each new work site. It is assumed that only 25% of the construction workers will bring their family to live in the region. For the remaining 75%, it is assumed that the laborers will establish temporary quarters for themselves, returning to their family residence when work schedules permit. For Otero County, the average construction-worker household size is estimated at 1.46 persons per unit. It is assumed that some of the secondary workers will live in the ROI outside of Otero County. These households are assumed to have the average size of households in the three-county region, which was 3.25 persons per unit in 1990.

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APPENDIX H

SOIL LOSS CALCULATIONS

APPENDIX H

H.1 CALCULATIONS TO DETERMINE SOIL LOSS FROM WATER EROSION.

The equation used to calculate soil loss by water erosion was the Universal Soil Loss Equation (USLE) (Fuller, 1984). The equation is

$$A=RK(LS)CP$$

where A, the predicted soil loss expressed in tons per acre per year, is the product of

R = climatic erosivity (rainfall and runoff)
K = soil erodibility
L = slope length
S = slope gradient or steepness
C = soil cover and management
P = erosion-control practice

The net water erosion for a given site is the sum of products of the appropriate A term times the corresponding soil type fractional area factors (percent of total area) for each soil type comprising the site.

Assumptions:

1. The R factor variable was obtained from R factor isopleth maps from NRCS.
2. Data for the variables K, S, and C were taken from the NRCS MUIR database.
3. The average slope percentage for the soil association was used. The slope length variable (L) was assumed to be 50 feet for all soils since this length is usually the maximum length for most rangeland sites.
4. The P variable was held at 1 for all soil loss predictions, which means no erosion-control practices were assumed. This is very conservative since permit, construction, and Best Management Practices (BMP) mitigation measures during construction and appropriate BMP mitigation during operations would be used to control soil loss.
5. Soil losses were calculated for the top soil horizon only.
6. These soils were assumed to produce grasslands, since the soil survey production data indicated that the most abundant species were grass species for a large percentage of the soils. The grass cover was assumed to be 35 percent for all soils with a litter cover of 20 percent for the no-disturbance scenario.
7. Percent rock cover was based on the percent of the soil that was comprised of rocks greater than 0.25 inches.
8. The entire 5,120-acre target complex at Tularosa Basin would be disturbed by clearance of unexploded ordnance.
9. Approximately 20 percent (1,024 acres) of the west Otero Mesa target site would be disturbed during construction.
10. Less than 20 percent of either target site would be redisturbed during operations.
11. Vegetation and litter cover was assumed to be zero for construction calculations.

In the calculations presented here, the National Ambient Air Quality Standards regulatory limit levels for air particulates (PM_{10} values) are not considered in order to estimate maximum impact conditions. Compliance with the PM_{10} 24-hour/once per year value of 10 $\mu g/m^3$ and annual value of 5 $\mu g/m^3$ would apply. Similarly, permit, construction, and BMP criteria would be used to maintain water erosion at acceptable levels. Mitigative measures during construction and operation would thus be used to control erosion processes which would result in soil losses much lower than calculated here.

H.1.1 West Otero Mesa NTC

The calculations given below show, for the soil type mix assumed for the NTC, that current and construction (which assumes no mitigative measures) conditions would result in 1 and 2 tons/acre/year soil loss due to water erosion.

Soil Loss from Water Erosion for Current West Otero Mesa NTC Conditions

Soil Type	Percent of Total Area	*R*	*K*	*LS*	*C*	*P*	*A*[1]	Net Erosion[2]
Philder	57	60	0.55	0.34	0.15	1	1.68	0.96
Lozier	14	60	0.10	1.30	0.04	1	0.31	0.04
Armesa	13	60	0.55	0.27	0.15	1	1.34	0.17
Rock Outcrop	5	--	--	--	--	--	0.00	0.00
Tencee	5	60	0.10	0.34	0.04	1	0.08	0.01
Reyab	4	60	0.55	0.34	0.15	1	1.68	0.08
Nickel	2	60	0.15	1.30	0.08	1	0.94	0.02
Tome	1	60	0.55	0.27	0.15	1	1.34	0.01
Total (tons/acre/year)								1.29

[1] *A* reflects total water erosion for a soil series as if it occupied 100 percent of the target area.
[2] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

Soil Loss from Water Erosion During Construction of West Otero Mesa NTC

Soil Type	Percent of Total Area	Disturbance	*R*	*K*	*LS*	*C*	*P*	*A*[1]	Fraction of Soil Type[2]	Weighted A[3]	Net A[4]	Net Erosion[5]
Philder	57	Disturbed	60	0.55	0.34	0.45	1	5.05	0.20	1.01[3]	.57	.58
		Undisturbed	60	0.55	0.34	0.15	1	1.68	0.80	1.35	.57	.77
Lozier	14	Disturbed	60	0.10	1.30	0.10	1	0.78	0.20	0.16	.14	.02
		Undisturbed	60	0.10	1.30	0.04	1	0.31	0.80	0.25	.14	.04
Armesa	13	Disturbed	60	0.55	0.27	0.45	1	4.01	0.20	0.80	.13	.10
		Undisturbed	60	0.55	0.27	0.15	1	1.34	0.80	1.07	.13	.14
Rock Outcro p	5	Disturbed	—	—	—	—	—	—	0.00	0.00	.05	0
		Undisturbed	—	—	—	—		—	0.00	0.00	.05	0
Tencee	5	Disturbed	60	0.10	0.34	0.10	1	0.20	0.20	0.04	.05	.002
		Undisturbed	60	0.10	0.34	0.04	1	0.08	0.80	0.07	.05	.004
Reyab	4	Disturbed	60	0.55	0.34	0.45	1	5.05	0.20	1.01	.04	.04
		Undisturbed	60	0.55	0.34	0.15	1	1.68	0.80	1.35	.04	.05
Nickel	2	Disturbed	60	0.15	1.3	0.20	1	2.34	0.20	0.47	.02	.009
		Undisturbed	60	0.15	1.3	0.08	1	0.94	0.80	0.75	.02	.02
Tome	1	Disturbed	60	0.55	0.27	0.45	1	4.01	0.20	0.80	.01	.008
		Undisturbed	60	0.55	0.27	0.15	1	1.34	0.80	1.07	.01	0.1
Total (tons/acre/year)												1.79

[1] *A* reflects total water erosion for a disturbance type (disturbed or undisturbed) as if it occupied 100 percent of the target area.
[2] The fraction of soil type value equals the percentage of the given soil type which is disturbed or undisturbed (note the percentages add to 1.0 for each soil type).
[3] The weighted *A* value is the product of the *A* value times the fraction of soil type value.
[4] Net *A* is obtained by adding the weighted *A* values for the disturbed and undisturbed portions of a particular soil type (e.g., for the Tencee soil type: 0.04 ton/acre/year from disturbed soils + 0.07 ton/acre/year from undisturbed soils = 0.11 ton/acre/year, which is the estimated soil loss if all target disturbances during construction were on Tencee soils where 20 percent was disturbed and 8 percent was undisturbed.
[5] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

H.1.2 Roads Outside the West Otero Mesa NTC

Eighty acres outside the target complex would be disturbed for roads during construction of the target complex. Because the location of roads in relation to soil series has not been established, road construction was assumed to have the same soil type area percentage composition as the NTC. Thus, the total erosion value for road construction is 2 tons/acre/year. Using the same assumption for current conditions, the 80-acre road construction area currently loses 1 ton/acre/year.

H.1.3 Soil Loss During West Otero Mesa NTC Operations

The amount of disturbed soil exposed during operation of the target complex has not been established, but is expected to be less than 20 percent (1,024 acres) of each target complex area. Total soil loss from water erosion during operations, assuming the same soil type area percentage composition as during construction, would therefore be in the range of 1 to 2 tons/acre/year, depending upon the extent of soil disruption and BMP mitigation measures.

H.1.4 Tularosa Basin NTC

The calculations given below show, for the soil type mix assumed for the NTC, that current and construction (which assumes no mitigative measures) conditions would result in 0.6 and 2 tons/acre/year soil loss due to water erosion.

Soil Loss from Water Erosion for Current Tularosa Basin NTC Conditions

Soil Type	Percent of Total Area	*R*	*K*	*LS*	*C*	*P*	*A*[1]	Net Erosion[2]
Lozier	32	60	0.10	1.3	0.04	1	0.31	0.10
Nickel	19	60	0.15	1.3	0.08	1	0.94	0.18
Tencee	13	60	0.10	1.3	0.04	1	0.31	0.04
Rock Outcrop	13	—	—	—	—	—	0.00	0.00
Tome	10	60	0.55	0.3	0.15	1	1.49	0.15
Mimbres	10	60	0.43	0.1	0.15	1	0.39	0.04
Reyab	2	60	0.55	0.3	0.15	1	1.49	0.03
Reakor	1	60	0.43	1.3	0.15	1	5.03	0.07
Total (ton/acre/year)								0.61

[1] *A* reflects total water erosion for a soil series as if it occupied 100 percent of the target area.
[2] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

Soil Loss from Water Erosion During Construction of Tularosa Basin NTC

Soil Type	Percent of Total Area	*R*	*K*	*LS*	*C*	*P*	*A*[1]	Fraction of Soil Type[2]	Weighted A[3]	Net A[4]	Net Erosion[5]
Lozier	32	60	0.10	1.3	0.1	1	0.78	1.00	0.78	0.78	0.25
Nickel	19	60	0.15	1.3	0.2	1	2.34	1.00	2.34	2.34	0.44
Tencee	13	60	0.10	1.3	0.1	1	0.78	1.00	0.78	0.78	0.10
Rock Outcrop	13	—	—	—	—	—	0.00	1.00	0.00	0.00	0.00
Tome	10	60	0.55	0.3	0.45	1	4.46	1.00	4.46	4.46	0.45
Mimbres	10	60	0.43	0.1	0.45	1	1.16	1.00	1.16	1.16	0.12
Reyab	2	60	0.55	0.3	0.45	1	4.46	1.00	4.46	4.46	0.09
Reakor	1	60	0.43	1.3	0.45	1	15.09	1.00	15.09	15.09	0.15
Total (tons/acre/year											1.60

[1] *A* reflects total water erosion for a soil series as if it occupied 100 percent of the target area.
[2] The fraction of soil type value equals 1.00 since it is assumed that 100 percent of the NTC area soil would be disturbed.
[3] The weighted *A* value is the product of the *A* value times the fraction of soil type value.
[4] Net *A* is obtained by adding the weighted *A* values for the disturbed and undisturbed portions of a particular soil type. Since it is assumed that all the soil would be disturbed, net *A* equals weighted *A*.
[5] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

H.1.5 Roads Outside the Tularosa Basin NTC

Eighty acres outside the target complex would be disturbed for roads during construction of the target complex. Because the location of roads in relation to soil series has not been established, road construction was assumed to have the same soil type area percentage composition as the NTC. Thus, the total erosion value for road construction is 2 tons/acre/year. Using the same assumption for current conditions, the 80-acre road construction area currently loses 0.6 ton/acre/year.

H.1.6 Soil Loss During Tularosa Basin NTC Operations

The amount of disturbed soil exposed during operation of the target complex is unknown, but is expected to be less than 20 percent (1,024 acres) of each target complex area. Total soil loss from water erosion during operations, assuming the same soil type area percentage composition as during construction, would therefore be in the range of 0.6 to 2 tons/acre/year, depending upon the extent of soil disruption and soil mitigation measures.

H.2 CALCULATIONS TO DETERMINE SOIL LOSS FROM WIND EROSION

The equation used to calculate soil loss by wind erosion was the Wind Erosion Prediction Equation (Fuller, 1987). The equation is:

$$E = f\,(IKCLV)$$

where *E*, the predicted soil loss expressed in tons per acre per year, is a function (*f*) of

I = soil erodibility
K = surface roughness
C = climate
L = the unsheltered distance across a field
V = vegetative cover

The net wind erosion for a given site is the sum of products of the appropriate *E* term times the corresponding soil type fractional area factors (percent of total area) for each soil type comprising the site.

Assumptions:

1. Current conditions at the target complex sites reflect the soil and vegetative data (*I*) found in the Natural Resource Conservation Service's MUIR databases for the soil survey covering McGregor Range.
2. *K* values assumed a smooth bare soil surface for all disturbances following construction.
3. *C* values were obtained from a *C* factor isoline map (Fuller, 1987).
4. *L* values were estimated from the target layout shown in this EIS.
5. Areas with disturbed soils would have soil data similar to that reported in the MUIR databases for the Fort Bliss area; however, these areas would have no vegetative production.
6. Small grain equivalents were calculated as described in Fuller (1987) for the production amounts in the MUIR database for range sites. Litter amounts were considered to be 20 percent of the total production for the site.
7. The entire 5,120-acre target complex at Tularosa Basin would be disturbed by clearance of unexploded ordnance.
8. Approximately 20 percent (1,024 acres) of the west Otero Mesa target site would be disturbed during construction.
9. Less than 20 percent of either target site would be disturbed during operations.

H.2.1 West Otero Mesa NTC

The calculations given below show, for the soil type mix assumed for the NTC, that current and construction (which assumes no mitigative measures) conditions would result in 5 and 20 tons/acre/year soil loss due to wind erosion.

Soil Loss from Wind Erosion for Current West Otero Mesa NTC Conditions

Soil Type	Percent of Total Area	*C*	*I*	*V*	*K*	*L*	*E*[1]	Net Erosion[2]
Lozier/Rock Outcrop	19	120	0	1330	1	10000	0.00	0.0
Nickel	2	120	56	1340	1	10000	7.4	0.1
Tencee	5	120	86	1340	1	10000	16.5	0.9
Tome	1	120	86	1157.5	1	10000	25.2	0.3
Reyab	4	120	86	1187.5	1	10000	25.2	0.9
Philder	57	120	86	1950	1	10000	4.1	2.3
Armesa	13	120	86	1745	1	10000	6.4	0.8
Total (tons/acre/year)								5.3

[1] *E* reflects total wind erosion for a soil series as if it occupied 100 percent of the target area.
[2] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

Soil Loss from Wind Erosion During Construction of West Otero Mesa NTC

Soil Type	Percent of Total Area	Disturbance	*C*	*I*	*V*	*K*	*L*	*E*[1]	Fraction of Soil Type[2]	Weighted E[3]	Net E[4]	Net Erosion[5]
Lozier/Rock Outcrop	19	Disturbed	120	0	1330	1	10000	0.0	0.80	0.0	.19	0
		Undisturbed	120	0	0	1	1000	0.0	0.20	0.0	.19	0
Nickel	2	Disturbed	120	56	1340	1	10000	7.4	0.80	5.9	.02	.12
		Undisturbed	120	56	0	1	1000	54.4	0.20	10.9	.02	.22
Tencee	5	Disturbed	120	86	1340	1	10000	16.5	0.80	13.2	.05	.66
		Undisturbed	120	86	0	1	1000	92.9	0.20	18.6	.05	.93
Tome	1	Disturbed	120	86	1157.5	1	10000	25.2	0.80	20.2	.01	.20
		Undisturbed	120	86	0	1	1000	92.9	0.20	18.6	.01	.19
Reyab	4	Disturbed	120	86	1187.5	1	10000	25.2	0.80	20.2	.04	.81
		Undisturbed	120	86	0	1	1000	92.9	0.20	18.6	.04	.74
Philder	57	Disturbed	120	86	1950	1	10000	4.1	0.80	3.3	.57	1.88
		Undisturbed	120	86	0	1	1000	92.9	0.20	18.6	.57	10.6
Armesa	13	Disturbed	120	86	1745	1	10000	6.4	0.80	5.1	.13	.66
		Undisturbed	120	86	0	1	1000	92.9	0.20	18.6	.13	2.42
Total (tons/acre/year)												19.43

[1] *E* reflects total wind erosion for a soil series as if it occupied 100 percent of the target area.
[2] The fraction of soil type value equals the percentage of the given soil type which is disturbed or undisturbed (note the percentages add to 1.0 for each soil type).
[3] The weighted *E* value is the product of the *E* value times the fraction of soil type value.
[4] Net *E* is obtained by adding the weighted *E* values from the disturbed and undisturbed portions of a particular soil type (e.g., for the Tencee soil type: 18.6 tons/acre/year from disturbed soils + 13.2 tons/acre/year from undisturbed soils = 31.8 tons/acre/year, which is the estimated soil loss if all target disturbances during construction were on Tencee soils where 20 percent was disturbed and 80 percent was undisturbed.
[5] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

H.2.2 Roads Outside the West Otero Mesa NTC

Eighty acres outside the target complex would be disturbed for roads during construction of the target complex. Because the location of roads in relation to soil series has not been established, road construction was assumed to have have the same soil type area percentage composition as the NTC. Thus, the total erosion value for road construction is 20 tons/acre/year. Using the same assumption for current conditions, the 80-acre road construction area currently loses 5 tons/acre/year.

H.2. 3 Soil Loss During West Otero Mesa NTC Operations

The amount of disturbed soil exposed during operation of the target complex has not been established, but is expected to be less than 20 percent (1,024 acres) of each target complex area. Total soil loss from wind erosion during operations, assuming the same soil type area percentage composition as during construction, would therefore be in the range of 5 to 20 tons/acre/year depending upon the extent of soil disruption and BMP mitigation measures.

Soil Loss from Wind Erosion for Current Tularosa Basin NTC Conditions

Soil Type	Percent of Total Area	*C*	*I*	*V*	*K*	*L*	*E*[1]	Net Erosion[2]
Lozier	44.7	150	0	1330	1	10000	0.0	0.0
Nickel	18.8	150	56	1340	1	10000	7.4	1.4
Tencee	13.1	150	86	1340	1	10000	16.5	2.2
Mimbres	10.1	150	48	1187.5	1	10000	9.6	1.0
Tome	10.3	150	86	1157.5	1	10000	25.2	2.6
Reyab	1.7	150	86	1187.5	1	10000	25.2	0.4
Reakor	1.3	150	86	1260	1	10000	25.2	0.3
Total (tons/acre/year)								7.9

[1] *E* reflects total wind erosion for a soil series as if it occupied 100 percent of the target area.
[2] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

H.2.4 Tularosa Basin NTC

The calculations given below show, for the soil type mix assumed for the NTC, that current and construction (which assumes no mitigation measures) conditions would result in 8 and 60 tons/acre/year soil loss due to wind erosion.

Soil Loss from Wind Erosion During Construction of Tularosa Basin NTC

Soil Type	Percent of Total Area	*C*	*I*	*V*	*K*	*L*	*E*[1]	Fraction of Soil Type[2]	Weighted *E*[3]	Net *E*[4]	Net Erosion[5]
Lozier	44.7	150	0	0	1	10000	0	1.00	0.0	0.0	0.0
Nickel	18.8	150	56	0	1	10000	84	1.00	84	84	15.8
Tencee	13.1	150	86	0	1	10000	129	1.00	129	129	16.9
Mimbres	10.1	150	48	0	1	10000	72	1.00	72	72	7.3
Tome	10.3	150	86	0	1	10000	129	1.00	129	129	13.3
Reyab	1.7	150	86	0	1	10000	129	1.00	129	129	2.2
Reakor	1.3	150	86	0	1	10000	129	1.00	129	129	1.7
Total (tons/acre/year)											57.2

[1] *E* reflects total wind erosion for a soil series as if it occupied 100 percent of the target area.
[2] The fraction of soil type value equals 1.00 since it is assumed that 100 percent of the NTC area soil type would be disturbed.
[3] The weighted *E* value is the product of the *E* value times the fraction of soil type value.
[4] Net *E* is obtained by adding the weighted *E* values from the disturbed and undisturbed portions of a particular soil type. Since it is assumed that all soil would be disturbed, net *E* equals weighted *E*.
[5] The net erosion is an area-weighted erosion value that reflects the erosion estimate for a given soil type based on the percent of total area occupied by that soil type.

H.2.5 Roads Outside the Tularosa Basin NTC

Eighty acres outside the target complex would be disturbed for roads during construction of the target complex. Because the location of roads in relation to soil series has not been established, road construction was assumed to have the same soil type area percentage composition as the NTC. Thus, the total erosion value for road construction is 60 tons/acre/year. Using the same assumption for current conditions, the 80-acre road construction area currently loses 8 tons/acre/year.

H.2.6 Soil Loss During Tularosa Basin NTC Operations

The amount of disturbed soil exposed during operation of the target complex is unknown, but is expected to be less than 20 percent (1,024 acres) of each target complex area. Total soil loss from wind erosion during operations, assuming the same soil type area percentage composition as during construction, would therefore be in the range of 8 to 60 tons/acre/year, depending upon the extent of soil disruption and BMP mitigation measures.

References

Fuller, William W., 1984. *Guide for Water Erosion Control*, Agronomy Technical Note No. 28. U.S. Department of Agriculture, Soil Conservation Service, New Mexico.

_____, 1987. *Guide for Wind Erosion Control*, Agronomy Technical Note No. 27. U.S. Department of Agriculture, Soil Conservation Service, New Mexico.

APPENDIX I

MAILS Air Quality Analysis

MAILS MODELING NUMBERS

AQCR 153

	Aircraft Type	Annual Sorties	Annual Passes	Proposed Action: Monthly Passes	Daily Passes *	Cumulative Impacts Scenario: 8-hour Passes **	3-hour Passes ***	1-hour Passes ****	
Tornado	Tornado	7,806	7,806	651	33	11	4	1	
T-1	T-1	25	25	2	1	1	1	1	adjusted daily numbers to account for small number
F-16(PW)	F-16	2,209	2,209	184	9	3	1	1	
A-10	A-10	182	182	15	1	1	1	1	adjusted daily numbers to account for small number
F-15E	F-15E	10	10	1	1	1	1	1	adjusted daily numbers to account for small number
F-4G	F-4	2,509	2,509	209	10	3	1	1	
B1	B-1	39	39	3	1	1	1	1	adjusted daily numbers to account for small number
B-52H	B-52	26	26	2	1	1	1	1	adjusted daily numbers to account for small number
HC-130H	HC-130	107	107	9	1	1	1	1	adjusted daily numbers to account for small number
F-18	F-18	105	105	9	1	1	1	1	adjusted daily numbers to account for small number
F-117	F-117	2,501	2,501	208	10	3	1	1	
F-14	F-14	10	10	1	1	1	1	1	adjusted daily numbers to account for small number
T-38	T-38	791	791	66	1	1	1	1	adjusted daily numbers to account for small number
	Total for all sorties	16,320	16,320	1,360	72	30	17	13	

* Daily passes = monthly passes/20 days.
** 8-hour is 8/24 of daily passes.

Passes /sortie = 1.00
**** 3-hour passess is 3/24 of daily passes.
***** 1-hour passess equal 1/24 hour passes.

MAILS MODELING NUMBERS

AQCR 156

				Proposed Action		Cumulative Impacts Scenario			
	Aircraft Type	Annual Sorties	Annual Passes	Monthly Passes	Daily Passes *	8-hour Passes **	3-hour Passes ***	1-hour Passes ****	
Tornado	Tornado	2,518	2,518	210	10	3	1	1	
T-1	T-1	26	26	2	1	1	1	1	adjusted daily numbers to account for small number
F-16(PW)	F-16	2,248	2,248	187	9	3	1	1	
A-10	A-10	120	120	10	1	1	1	1	adjusted daily numbers to account for small number
F-15E	F-15E	13	13	1	1	1	1	1	adjusted daily numbers to account for small number
F-4G	F-4	2,702	2,702	225	11	4	1	1	
B1	B-1	0	0	0	1	1	1	1	adjusted daily numbers to account for small number
B-52H	B-52	0	0	0	1	1	1	1	adjusted daily numbers to account for small number
HC-130H	HC-130	145	145	12	1	1	1	1	adjusted daily numbers to account for small number
F-18	F-18	69	69	6	1	1	1	1	adjusted daily numbers to account for small number
F-117	F-117	12,438	12,438	1036	52	17	6	1	
F-14	F-14	16	16	1	1	1	1	1	adjusted daily numbers to account for small number
T-38	T-38	70	70	6	1	1	1	1	adjusted daily numbers to account for small number
	Total for all sorties	20,364	20,364	1,697	92	37	19	13	

Passes /sortie = 1.00

* Daily passes = monthly passes/20 days.

** 8-hour is 8/24 of daily passes.

**** 3-hour passes is 3/24 of daily passes.

***** 1-hour passess equal 1/24 hour passes.

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : CO
Avg. Period: 1-hour

No. of Aircraft (Types) : 10
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	1-hour Conc. (micrograms/m**3)
TORO	300	405	34.52	1	.2252
A10Y	300	405	18.70	1	.1220
F15X	300	550	18.14	1	.0872
F4GX	300	550	102.13	1	.4907
C130H	300	240	4.88	1	.0537
F18	300	550	135.00	1	.6486
F14	300	550	31.38	1	.1508
T38X	300	485	152.54	1	.8311
F-117X	300	600	18.10	1	.0797
F16X	300	550	9.29	1	.0446

Total 1-hour conc. = 2.7337

The total 1-hour conc. is 6.83E-03 % of the PSD Class I 1-hour increment for CO (40000 micrograms/m**3)

The total 1-hour conc. is 6.83E-03 % of the NAAQS Class I 1-hour increment for CO (4.00E+04 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : CO
Avg. Period: 8-hour

No. of Aircraft (Types) : 10
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	8-hour Conc. (micrograms/m**3)
TORO	300	405	34.52	3	.0279
A10Y	300	405	18.70	1	.0050
F15X	300	550	18.14	1	.0036
F4GX	300	550	102.13	4	.0810
C130H	300	240	4.88	1	.0022
F18	300	550	135.00	1	.0268
F14	300	550	31.38	1	.0062
T38X	300	485	152.54	1	.0343
F-117X	300	600	18.10	17	.0559
F16X	300	550	9.29	3	.0055

Total 8-hour conc. = .2484

The total 8-hour conc. is 2.48E-03 % of the PSD Class I 8-hour increment for CO (10000 micrograms/m**3)

The total 8-hour conc. is 2.48E-03 % of the NAAQS Class I 8-hour increment for CO (1.00E+04 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : NO2
Avg. Period: Annual

No. of Aircraft (Types) : 10
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	Annual Conc. (micrograms/m**3)
TORO	300	450	53.38	2518	.0090
A10Y	300	405	2.38	120	2.13E-05
F15X	300	550	442.64	13	.0003
F4GX	300	550	208.18	2702	.0309
C130H	300	240	21.44	145	.0004
F18	300	550	300.00	69	.0011
F14	300	550	246.42	16	.0002
T38X	300	485	13.68	70	5.96E-05
F-117X	300	600	432.28	1244	.0270
F16X	300	550	278.64	2248	.0344

Total annual conc. = .1034

The total annual conc. is 4.1357 % of the PSD Class I annual increment for NO2 (2 micrograms/m**3)

The total annual conc. is .1034 % of the NAAQS Class I annual increment for NO2 (1.00E+02 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : PART
Avg. Period: 24-hour

No. of Aircraft (Types) : 10
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	24-hour Conc. (micrograms/m**3)
TORO	300	450	8.42	10	.0052
A10Y	300	405	5.42	1	.0004
F15X	300	550	8.37	1	.0004
F4GX	300	550	18.07	11	.0099
C130H	300	240	1.01	1	.0001
F18	300	550	30.00	1	.0015
F14	300	550	123.43	1	.0062
T38X	300	485	.11	1	6.24E-06
F-117X	300	600	48.16	52	.1149
F16X	300	550	3.51	9	.0016

Total 24-hour conc. = .1402

The total 24-hour conc. is 1.7520 % of the PSD
Class I 24-hour increment for PART(8 micrograms/m**3)

The total 24-hour conc. is .0934 % of the NAAQS
Class I 24-hour increment for PART(1.50E+02 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : PART
Avg. Period: Annual

No. of Aircraft (Types) : 10
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	Annual Conc. (micrograms/m**3)
TORO	300	450	8.42	2518	.0014
A10Y	300	405	5.42	120	4.84E-05
F15X	300	550	8.37	13	5.97E-06
F4GX	300	550	18.07	2702	.0027
C130H	300	240	1.01	145	1.84E-05
F18	300	550	30.00	69	.0001
F14	300	550	123.43	16	.0001
T38X	300	485	.11	70	4.79E-07
F-117X	300	600	48.16	1244	.0030
F16X	300	550	3.51	2248	.0004

Total annual conc. = .0078

The total annual conc. is .1960 % of the PSD Class I annual increment for PART(4 micrograms/m**3)

The total annual conc. is .0157 % of the NAAQS Class I annual increment for PART(5.00E+01 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : SO2 No. of Aircraft (Types) : 10
Avg. Period: 3-hour Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	3-hour Conc. (micrograms/m**3)
TORO	300	450	4.55	1	.0045
A10Y	300	405	2.93	1	.0032
F15X	300	550	5.44	1	.0044
F4GX	300	550	10.61	1	.0085
C130H	300	240	4.97	1	.0091
F18	300	550	15.00	1	.0120
F14	300	550	14.80	1	.0119
T38X	300	485	2.84	1	.0026
F-117X	300	600	8.73	6	.0384
F16X	300	550	5.57	1	.0045

Total 3-hour conc. = .0990

The total 3-hour conc. is .3959 % of the PSD Class I 3-hour increment for SO2 (25 micrograms/m**3)

The total 3-hour conc. is .0076 % of the NAAQS Class I 3-hour increment for SO2 (1.30E+03 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : SO2 — No. of Aircraft (Types) : 10
Avg. Period: 24-hour — Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	24-hour Conc. (micrograms/m**3)
TORO	300	450	4.55	10	.0028
A10Y	300	405	2.93	1	.0002
F15X	300	550	5.44	1	.0003
F4GX	300	550	10.61	11	.0058
C130H	300	240	4.97	1	.0006
F18	300	550	15.00	1	.0008
F14	300	550	14.80	1	.0007
T38X	300	485	2.84	1	.0002
F-117X	300	600	8.73	52	.0208
F16X	300	550	5.57	9	.0025

Total 24-hour conc. = .0347

The total 24-hour conc. is .6931 % of the PSD Class I 24-hour increment for SO2 (5 micrograms/m**3)

The total 24-hour conc. is .0095 % of the NAAQS Class I 24-hour increment for SO2 (3.65E+02 micrograms/m**3)

HOLLOMAN II EIS - REASONABLE PRACTICAL SCENARIO - AQCR 156

Pollutant : SO2 No. of Aircraft (Types) : 10
Avg. Period: Annual Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	Annual Conc. (micrograms/m**3)
TORO	300	450	4.55	2518	.0008
A10Y	300	405	2.93	120	2.62E-05
F15X	300	550	5.44	13	3.88E-06
F4GX	300	550	10.61	2509	.0015
C130H	300	240	4.97	145	9.06E-05
F18	300	550	15.00	69	5.68E-05
F14	300	550	14.80	16	1.30E-05
T38X	300	485	2.84	70	1.24E-05
F-117X	300	600	8.73	1244	.0005
F16X	300	550	5.57	2248	.0007

Total annual conc. = .0037

The total annual conc. is .1832 % of the PSD Class I annual increment for SO2 (2 micrograms/m**3)

The total annual conc. is .0046 % of the NAAQS Class I annual increment for SO2 (8.00E+01 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : CO
Avg. Period: 1-hour

No. of Aircraft (Types) : 12
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	1-hour Conc. (micrograms/m**3)
TORO	300	405	34.52	2	.4505
A10Y	300	405	18.70	1	.1220
F15X	300	550	18.14	1	.0872
F4GX	300	550	102.13	1	.4907
B1BX	300	610	76.00	1	.3292
B52HX	300	400	14.35	1	.0948
C130H	300	240	4.88	1	.0537
F18	300	550	135.00	1	.6486
F14	300	550	31.38	1	.1508
T38X	300	485	152.54	1	.8311
F-117X	300	600	18.10	1	.0797
F16X	300	550	9.29	1	.0446

Total 1-hour conc. = 3.3830

The total 1-hour conc. is 8.46E-03 % of the PSD Class I 1-hour increment for CO (40000 micrograms/m**3)

The total 1-hour conc. is 8.46E-03 % of the NAAQS Class I 1-hour increment for CO (4.00E+04 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : CO
Avg. Period: 8-hour

No. of Aircraft (Types) : 12
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	8-hour Conc. (micrograms/m**3)
TORO	300	405	34.52	19	.1765
A10Y	300	405	18.70	1	.0050
F15X	300	550	18.14	1	.0036
F4GX	300	550	102.13	6	.1214
B1BX	300	610	76.00	1	.0136
B52HX	300	400	14.35	1	.0039
C130H	300	240	4.88	1	.0022
F18	300	550	135.00	1	.0268
F14	300	550	31.38	1	.0062
T38X	300	485	152.54	1	.0343
F-117X	300	600	18.10	6	.0197
F16X	300	550	9.29	5	.0092
			Total 8-hour conc. =		.4225

The total 8-hour conc. is 4.23E-03 % of the PSD Class I 8-hour increment for CO (10000 micrograms/m**3)

The total 8-hour conc. is 4.23E-03 % of the NAAQS Class I 8-hour increment for CO (1.00E+04 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : NO2
Avg. Period: Annual

No. of Aircraft (Types) : 12
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	Annual Conc. (micrograms/m**3)
TORO	300	450	53.38	7806	.0279
A10Y	300	405	2.38	182	3.23E-05
F15X	300	550	442.64	10	.0002
F4GX	300	550	208.18	2509	.0286
B1BX	300	610	23.00	39	4.44E-05
B52HX	300	400	53.04	26	.0001
C130H	300	240	21.44	107	.0003
F18	300	550	300.00	105	.0017
F14	300	550	246.42	10	.0001
T38X	300	485	13.68	791	.0007
F-117X	300	600	432.28	2501	.0544
F16X	300	550	278.64	2209	.0338

Total annual conc. = .1479

The total annual conc. is 5.9177 % of the PSD Class I annual increment for NO2 (2 micrograms/m**3)

The total annual conc. is .1479 % of the NAAQS Class I annual increment for NO2 (1.00E+02 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : PART
Avg. Period: 24-hour

No. of Aircraft (Types) : 12
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	24-hour Conc. (micrograms/m**3)
TORO	300	450	8.42	33	.0170
A10Y	300	405	5.42	1	.0004
F15X	300	550	8.37	1	.0004
F4GX	300	550	18.07	10	.0090
B1BX	300	610	.20	1	9.03E-06
B52HX	300	400	11.42	1	.0008
C130H	300	240	1.01	1	.0001
F18	300	550	30.00	1	.0015
F14	300	550	123.43	1	.0062
T38X	300	485	.11	1	6.24E-06
F-117X	300	600	48.16	10	.0221
F16X	300	550	3.51	9	.0016

Total 24-hour conc. = .0591

The total 24-hour conc. is .7387 % of the PSD Class I 24-hour increment for PART(8 micrograms/m**3)

The total 24-hour conc. is .0394 % of the NAAQS Class I 24-hour increment for PART(1.50E+02 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : PART
Avg. Period: Annual

No. of Aircraft (Types) : 12
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	Annual Conc. (micrograms/m**3)
TORO	300	450	8.42	7806	.0044
A10Y	300	405	5.42	182	7.35E-05
F15X	300	550	8.37	10	4.59E-06
F4GX	300	550	18.07	2509	.0025
B1BX	300	610	.20	39	3.86E-07
B52HX	300	400	11.42	26	2.24E-05
C130H	300	240	1.01	107	1.36E-05
F18	300	550	30.00	105	.0002
F14	300	550	123.43	10	6.77E-05
T38X	300	485	.11	791	5.41E-06
F-117X	300	600	48.16	2501	.0061
F16X	300	550	3.51	2209	.0004

Total annual conc. = .0137

The total annual conc. is .3433 % of the PSD Class I annual increment for PART(4 micrograms/m**3)

The total annual conc. is .0275 % of the NAAQS Class I annual increment for PART(5.00E+01 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : SO2 No. of Aircraft (Types) : 12
Avg. Period: 3-hour Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	3-hour Conc. (micrograms/m**3)
TORO	300	450	4.55	7	.0312
A10Y	300	405	2.93	1	.0032
F15X	300	550	5.44	1	.0044
F4GX	300	550	10.61	2	.0170
B1BX	300	610	10.00	1	.0072
B52HX	300	400	6.24	1	.0069
C130H	300	240	4.97	1	.0091
F18	300	550	15.00	1	.0120
F14	300	550	14.80	1	.0119
T38X	300	485	2.84	1	.0026
F-117X	300	600	8.73	2	.0128
F16X	300	550	5.57	2	.0089
			Total 3-hour conc. =		.1271

The total 3-hour conc. is .5084 % of the PSD Class I 3-hour increment for SO2 (25 micrograms/m**3)

The total 3-hour conc. is .0098 % of the NAAQS Class I 3-hour increment for SO2 (1.30E+03 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : SO2
Avg. Period: 24-hour

No. of Aircraft (Types) : 12
Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	24-hour Conc. (micrograms/m**3)
TORO	300	450	4.55	33	.0092
A10Y	300	405	2.93	1	.0002
F15X	300	550	5.44	1	.0003
F4GX	300	550	10.61	10	.0053
B1BX	300	610	10.00	1	.0005
B52HX	300	400	6.24	1	.0004
C130H	300	240	4.97	1	.0006
F18	300	550	15.00	1	.0008
F14	300	550	14.80	1	.0007
T38X	300	485	2.84	1	.0002
F-117X	300	600	8.73	10	.0040
F16X	300	550	5.57	9	.0025

Total 24-hour conc. = .0246

The total 24-hour conc. is .4917 % of the PSD
Class I 24-hour increment for SO2 (5 micrograms/m**3)

The total 24-hour conc. is .0067 % of the NAAQS
Class I 24-hour increment for SO2 (3.65E+02 micrograms/m**3)

HOLLOMAN II EIS - IMPACTS OF THE PROPOSED ACTION ON AQCR 153

Pollutant : SO2   No. of Aircraft (Types) : 12
Avg. Period: Annual   Mixing Height : 5000 ft.

Aircraft	Altitude (ft)	Airspeed (mph)	Emiss. Rate (lb/hr)	Flight Freq.	Annual Conc. (micrograms/m**3)
TORO	300	450	4.55	7806	.0024
A10Y	300	405	2.93	182	3.97E-05
F15X	300	550	5.44	10	2.98E-06
F4GX	300	550	10.61	2509	.0015
B1BX	300	610	10.00	39	1.93E-05
B52HX	300	400	6.24	26	1.22E-05
C130H	300	240	4.97	107	6.68E-05
F18	300	550	15.00	105	8.64E-05
F14	300	550	14.80	10	8.12E-06
T38X	300	485	2.84	791	.0001
F-117X	300	600	8.73	2501	.0011
F16X	300	550	5.57	2209	.0007

Total annual conc. = .0060

The total annual conc. is .2994 % of the PSD Class I annual increment for SO2 (2 micrograms/m**3)

The total annual conc. is .0075 % of the NAAQS Class I annual increment for SO2 (8.00E+01 micrograms/m**3)

APPENDIX J

BIOLOGY

APPENDIX J

Response of Animals to Noise and Overflight

The potential changes in aircraft activity under the proposed action could result in increased potential for animals to be startled by aircraft overflight noise. Studies and incidental observations have been made on the response of animals to noise and aircraft. In general, the long-term effects of aircraft overflights on wildlife are unclear. Reported animal responses vary greatly among species, and the ability of species to adapt to overflights also varies. The potential consequences from noise are thought to be greatest on breeding animals (USDOI, 1995). However, the majority of studies on wildlife responses to overflights suggest that responses appear to be temporary and do not result in effects to animal population or long-term habitat use. However, there are few studies that provide substantial empirical data on long-term impacts of chronic noise exposure. The few studies available evaluated measures of reproductive success (e.g., return to nest sites, fledgling body weights, number of young raised) over a one- or two-year period. Some studies suggest hypotheses based on extrapolated data. Other studies point out that long-term impacts could not be extrapolated or estimated from the reported data. Below is a summary of studies and observations made on the responses of animals to noise and aircraft overflights.

General. This summary focuses on research reports evaluating wildlife response to subsonic, low-level overflight by fixed-wing aircraft since this is the type of noise source that would be encountered (excluding the target areas, ranges where human presence and ordnance use would occur). General points of this literature review are:

- Long-term chronic impacts from low-level subsonic aircraft overflight, if any, are poorly understood.
- Physiological responses varied among the species evaluated and included: short-term heart rate increase; no change in reproductive success; reduced reproductive success; reduced weight gain; and adrenal gland weight increase (stress indicator).
- Behavioral responses varied by individual animal for each species evaluated. Common responses included: alert behavior; flushing from perches, roosts, or nests for a short time; running short distances; and individual animals changing use of or leaving home ranges.

Animal responses reported in the literature are physiological and/or behavioral (Knight and Gutzwiller, 1995). Physiological effects may include temporary or permanent hearing threshold shifts, masking of auditory signals, increased respiration and heart rate, and increased corticosteroid levels. Reported hearing threshold shifts were related to noise sources that were of much greater duration (minutes and hours) than an aircraft overflight (about three seconds at 100 dBA). Behavioral responses may include animals becoming alert and turning toward the sound source, running from the sound

source, changes in activity patterns (e.g., interrupted feeding), nest abandonment, or change in habitat use. If the changes are sufficiently severe, the health and survival of an individual animal may be reduced. If a large number of animals are affected, then population declines could result. Below is a brief discussion of studies on the effects of noise on specific animals and animal populations.

Sensitivity to noise and other disturbances varies among bird species and among individuals within species, due in part to differences in hearing acuity and previous exposures to noise. Sensitivity to noise is also dependent on timing; birds are typically most sensitive to disturbance during the nesting season.

Upland Birds. Studies of noise effects on gallinaceous birds are rare for upland game birds but more common for poultry. At Naval Air Station Fallon, chukar exhibited brief (average 57 seconds) changes in behavior in response to aircraft disturbances (Lamp, 1987). Shotten (1982) found that bird populations did not vacate areas in response to aircraft overflights. Sage grouse (*Centrocercus urophasianus*) leks (mating areas) occur in areas near targets where low-level military jet overflights occur as they approach the Saylor Creek Range target area in southwest Idaho. Nesting and brood-rearing wild turkey (*Meleagris gallopavo*) exposed to simulated sonic booms exhibited only a few seconds of alert behavior, did not flush from nests, and broods did not scatter, resuming normal activity within 30 seconds (Lynche and Speake, 1978). Similarly, Teer and Truett (1973) reported no difference in hatching success by Northern bobwhite (*Colinus virginianus*) exposed to simulated sonic booms. Based on these studies, it is unlikely that gallinaceous bird populations would exhibit measurable responses to continued low-level overflight.

Shorebirds and Waterfowl. Several studies have focused on the impacts of aircraft noise on waterbirds. A majority of studies involved piston-powered, fixed-wing aircraft or helicopters that may or may not elicit different behavioral responses than subsonic and supersonic jets due to differences in noise frequencies and levels, and different visual stimuli; therefore, their applicability to the proposed military activity is speculative. Limited studies are available on waterfowl responses to low-level aircraft overflights; there are virtually no data available on response of songbirds to aircraft overflights. In a recent study, Fleming et al. (1996) reported that evaluation of 30 years of data demonstrated that abundance and diversity of ducks were not affected by aircraft overflights. In addition, energetics of adults were not affected by noise levels simulating overflights. However, they did state that reproductive success of captive birds was affected by simulated aircraft noise. The reduced reproductive success was in part caused by higher juvenile mortality. Several studies report contradictory results on the effects of military overflights on time-activity budgets of waterbirds (Black et al., 1984; Lamp, 1987; Fleming et al., 1996). Observational studies (Gladwin et al., 1987) and research have demonstrated that disturbances (including aircraft overflights) may result in short-term startle responses and temporary displacement from areas by

waterfowl (Belanger and Bedard, 1990; Hensen and Grant, 1991). Results from a comprehensive study indicated that the effects of military overflights on waterbirds in Florida did not adversely affect breeding success, colony establishment, or size (Black et al., 1984). Fleming et al. (1996) found that the energy costs associated with response behaviors of wintering black ducks (*Anas rubripes*) to military overflights in North Carolina were low. However, Ward and Stehn (1989) report that foraging activity of staging geese in Alaska was disrupted by helicopter and fixed-wing aircraft overflights. Schweinsburg (1974) found that duck populations on Canadian North Slope lakes showed short-term decreases, as much as 40 percent, when aircraft overflights occurred. Lamp (1987) reported that some waterbird species were sensitive to both subsonic and supersonic military overflights, with snow geese exhibiting adverse responses (alert calling, alert posture, flight) 59 percent of the time. Other species that displayed sensitivity to military overflights in Lamp's study include Northern pintail, long-billed dowitcher, American widgeon, and green-winged teal. Additionally, Lamp (1987) reported that passing aircraft generally elicited no response from flocks of white-faced ibis. However, in two instances involving low-level bombing runs, the birds flushed and vacated the feeding area. Bunnell et al. (1981) also found that low-level aircraft overflights impacted survivorship of young and reproductive success of a colony of American white pelicans.

Based on the results of these studies, impacts to shorebirds and waterfowl would likely be low. All areas used by shorebirds and waterfowl underlie existing airspace. These areas of shorebird and waterfowl concentrations would be avoided by aircraft to ensure that direct overflights would not occur. The increased or decreased airspace use by aircraft among training options where shorebird and waterfowl concentrations exist (VR-176, VR-100/125, and IR-113) would be distributed over a wide area and therefore would not overfly the bird concentrations. Therefore, impacts from increased use of these airspaces compared to existing use would likely result in marginally higher but similar daily flights near these bird concentration areas. The following general impacts would be anticipated in areas of wintering and breeding shorebirds and waterfowl, especially in areas where bird concentrations occur along the Rio Grande (e.g., Bosque del Apache National Wildlife Refuge, Elephant Butte and Caballo reservoirs) and the Pecos River (Sumner Lake, Santa Rosa Lake, and Brantley Reservoir):

- Low-level overflight over concentrations of wintering shorebirds and waterfowl would likely result in flushing of birds. This would be minimized or eliminated by pilots avoiding these areas during nesting and winter seasons.
- Breeding success of some individual birds may be affected, but measurable population declines would be unlikely.

Raptors. Several studies have evaluated the effects of human-induced disturbance and noise on raptors. Raptor responses to noise and disturbance in these studies have varied. Most impacts reported appeared to be minor and

temporary (e.g., Lamp, 1987) and, where evaluated, did not noticeably affect reproduction. The studies discussed below evaluated noise sources from ground-based activities and aircraft. Frazer et al. (1985) and Grubb and King (1991) reported that nesting raptors were more sensitive to ground-based activities compared to aircraft. Similarly, Grubb and King (1991) reported that animals show a greater response to rotary aircraft compared to fixed-wing aircraft. However, the general findings of studies of ground-based and rotary aircraft noise are also provided to further show the general adaptability of raptors to noise.

Grubb and King (1991) evaluated nesting bald eagles and reported that eagles reacted more strongly to pedestrians and helicopters than to fixed-wing military jet aircraft. Eagles responded to aircraft 75 percent of the time when overflights were about 300 feet from the nests. They suggested that severity of response was related to a variety of factors including distance (most important), duration, visibility, number, position, and noise level. They did note that response to aircraft did not linearly increase as distance decreased. Frazer et al. (1985) evaluated responses of bald eagles in Minnesota to overflights. Based on over 850 overflights of fixed-wing aircraft, only two eagles flushed from nests and only 10 percent of birds flushed from perches.

Anderson et al. (1990) evaluated the responses of red-tailed hawks, Swainson's hawks, ferruginous hawks, and golden eagles to ground-based military training activities occurring in August in southeastern Colorado. The authors reported that home range size generally increased during military training; one of two ferruginous hawks and the Swainson's hawk left the area and did not return until the following spring. The authors speculated that the changes in home range may increase energy needed by the birds and reduce reproductive success if training occurs during the nesting season.

Holthuijzen et al. (1990) studied the response of four nesting pairs of prairie falcons to construction blasting and four nesting pairs to experimental blasting in southwest Idaho. They reported that incubating and brooding falcons flushed about 22 percent of the time but on average returned to the nest within 3.4 minutes and resumed activities within an additional 2.5 minutes. Two of the four pairs exposed to construction blasting fledged young, while all four pairs exposed to experimental blasting fledged young. Three of four nests in the construction blasting area were not reoccupied the following year, whereas all nests were reoccupied in the experimental blasting area. The authors suggested that activities not be conducted closer than about 140 feet when peak noise levels were 140 dB or less. In addition, they suggested that no more than three blasts a day occur.

Several studies evaluated raptor responses to helicopters. Ritchie (1987) reported that peregrine falcon responses varied from no response to flushing when helicopters were within 2,000 feet of the birds. Craig and Craig (1984) reported that prairie falcons, red-tailed hawks, and golden eagles either did not respond or flushed from perches when helicopters passed nearby. In a study of

red-tailed hawk response to helicopters, Anderson et al. (1989) reported that birds would flush from their nests but that the overflights did not affect rearing of young. White and Sherrod (1973) reported that nesting raptors flushed from nests when overflown by helicopters that approached unseen. The authors suggested that raptors may be more likely to flush if the noise or sight of the aircraft is sudden and in close range to the nests.

Jackson et al. (1977) reported that a Northern harrier hunted on a target range near a target site in Mississippi. Aircraft passed through the range at about one-minute intervals at 1,800 feet AGL and noise levels ranged between 80 and 87 dB. The bird maintained hunting activities even when practice ordnance struck within 200 feet of the bird.

Response of nesting raptors to fixed-wing aircraft has been investigated for several species. Poole (1989) reported that ospreys rarely left the nest when exposed to fixed-wing aircraft. Similarly, White and Thurow (1985) reported that ferruginous hawks did not respond to fixed-wing aircraft within 100 feet of their nests.

Army National Guard training within the Snake River Birds of Prey National Conservation Area has been associated with increased foraging distances and temporary training area avoidance in prairie falcons (Marzluff et al., 1994). Increases in foraging distances may cause stress to birds by affecting the energetic costs of foraging.

Noise from low-level jets and sonic booms has been found to have little effect on nesting peregrine falcons and other raptor species (Ellis, 1981; Ellis et al., 1991). Birds appeared alarmed only for a brief period when noise stimuli was presented. Additionally, nesting success and subsequent territory occupancy rates did not decline.

Ellis (1981) evaluated the response of nesting peregrine falcons and other raptors (including the closely related prairie falcon) to low-level jet aircraft in Arizona. Birds were observed during more than 1,000 overflights resulting in noise levels of 82 to 114 dBA. Responses including stopping current behavior and watching the aircraft; alarm behavior occurred when aircraft were between 500 feet (nearest reported distance) and 1,600 feet AGL. The responses were temporary and did not result in reproductive failures. Birds did not respond appreciably to aircraft beyond 1,640 feet. Limited physiological data collected on prairie falcons indicated that elevated heart rates caused by aircraft overflights were temporary and within the normal response parameters of the species.

In a follow-on study, Ellis et al. (1991) evaluated the effects of low-level military aircraft flights on 18 peregrine falcon nest sites and nearly 40 breeding attempts of several other raptor species, including prairie falcons. Response of raptors was observed for more than 1,000 overflights that ranged from 220 feet to 1,500 feet from nests and generally resulted in SELs greater than 90 dBA. Of the 1,000+ flights, 482 were within 500 feet of nests. Of the 482 passes within 500

feet, only 52 (four percent) resulted in cowering or flight responses. The remaining 430 flights (96 percent) resulted in birds temporarily stopping activities, orientating and observing the aircraft, or exhibiting no response. In addition, the authors noted that all responses to aircraft were temporary and minor. Fledgling success for all raptor nests observed was 89 percent (34 of 38 nests) and peregrine falcon fledgling success was similar to general state trends. Similarly, 21 of the 22 peregrine falcon nests used for observations during the study were occupied the following year, with 19 positively identified as active nests. The authors did state that extrapolation of the results estimating long-term productivity impacts was not feasible.

Evaluations of aircraft overflight effects on peregrine falcons just west of Colorado Springs and the Fort Carson Airburst Gunnery Range were initiated in 1994. Five adult birds were fitted with telemetry and movements were monitored in 1994 (Enderson and Craig, 1994a; 1994b) and 1996 (Enderson, 1996). Although the study was preliminary, observational information was generated regarding movements (Enderson and Craig, 1994b) and response to overflights. Home ranges averaged about 350 square miles and overlapped. Adults hunted up to 32 miles from nest sites, with 35 percent of the locations on Fort Carson (Enderson, 1996). Additional locations of peregrine falcons were made to the east of Fort Carson (Enderson and Craig, 1994b). Enderson (1996) also stated that two juvenile peregrine falcons from nests moved to the west boundary of Fort Carson while still being fed by adults. A month after leaving the nest, the juveniles could not be located and it is presumed that they dispersed from the region. Enderson (1996) speculated, based on other observations, that sudden dispersal may be typical.

Enderson (1996) discussed observations and provided opinion regarding impacts of aircraft flights near peregrine falcon nests. He observed several F-16 flights near a nesting cliff under Fremont MOA (Proposed Airburst A MOA). Dr. Enderson stated:

> "Although aircraft approached the nests as close as about 600 yards, nesting proceeded normally."

Based on the study, Enderson further stated:

> "I saw no evidence that military operations in any way affected the ordinary outcomes of nesting activities. Peregrines are alert, active, and aggressive; they often attack other raptors and are normally excited on a near-daily basis. They live in a very noisy environment, given almost daily thunderstorm activity over their nest cliffs. They appeared acclimated to noise."

An ongoing observational study of Mexican spotted owl responses to military overflights in Colorado suggests that this species responds similarly to overflights as was reported by Ellis et al. (1991) for peregrine falcons (Masse, 1996).

In summary, impacts to raptors from aircraft overflight would include the potential of flushing: nesting falcons and hawks if flights are within 1,600 feet; nesting Mexican spotted owls if flights are within 500 feet; nesting bald eagles if flights are within 2,600 feet; and wintering bald eagles if flights are within 500 feet.

Bats and Small Mammals. Few studies have been conducted on the effects of noise on bats. Howell (1992) found that noise from unmanned aerial vehicles overlapped with lesser long-nosed bat's hearing at only one frequency (30 kilohertz [kHz]), and flights at operational cruising altitude (3,000 feet AGL) were inaudible to bat species. Another study conducted on the lesser long-nosed bat found no apparent short-term effects of low-altitude jet aircraft on bat maternity roosts; however, the authors stated that the results may not be adequate to extrapolate to other areas or conditions (Dalton and Dalton, 1993). Griffin et al. (1963) found echolocating Townsend's big-eared bats were able to resist jamming from a constant noise field by orienting to second harmonics. Jamming resistance and an ability to navigate and locate targets despite acoustical clutter and interference has been demonstrated for numerous other bat species (Simmons et al., 1974; McCarty and Jen, 1983; Troest and Mohl, 1986; Schmidt and Joermann, 1987). Based on these limited studies of bat response to noise, the effects from increased overflights of aircraft using existing low-level airspace (the MTRs, Talon Low MOA, Pecos Low MOA, and McGregor Range [R-5103]) would be expected to be low. Bat roost sites (summer and maternal), especially for colonial bats, are the habitats of importance that may be disturbed by aircraft overflights. These roost and potential roost sites have historically been overflown by low-level military jet aircraft. Continued aircraft overflights would be dispersed over large areas (e.g., MTR corridor widths range from five to over 50 nautical miles). Therefore, the number of overflights over any specific roost site would be small (less than one per day). In addition, noise levels within roosts would probably be lower than outside the roosts because the caves and crevices used would attenuate the sound, thus further reducing the potential disturbance to bats. Potential bat roost sites on McGregor Range are located along the escarpment near the proposed NTC sites. Based on 1997 surveys of the escarpment, no major colonial roost sites were identified, although small roost sites were identified. Increased overflights on McGregor Range would result in increased noise exposure to bats using the escarpment for roosting.

Studies on the effects of noise on wild small mammals have shown increased adrenal and body weights as well as temporary threshold shifts in hearing. Long-term exposure to aircraft noise has been shown to cause increased adrenal weights in mice, which generally corresponds to higher levels of stress. However, no adverse impacts on longevity, reproductive success, or health were detected or noted (Chesser et al., 1975). A study testing the effects of off-road vehicle impacts reported that vehicle noise caused a temporary shift in hearing sensitivity in desert kangaroo rats, with recovery of hearing thresholds taking at least three weeks (Brattstrom and Bondello, 1983). Kangaroo rat species have highly developed hearing capabilities that they depend on for

predator avoidance (Webster and Webster, 1972). Damage to kangaroo rat hearing would result in altered rates of predation.

Large Mammals. Studies of big game generally suggest that responses to overflights are usually temporary. Lamp (1987) found that response of mule deer to overflights at Naval Air Station Fallon, Nevada were temporary behavioral changes and minor changes in winter habitat use. However, Lamp (1987) suggested that long-term cumulative impacts are unknown and need to be evaluated in future studies. In a similar study in Nevada, mule deer exhibited either minor (attentive behavior) or no reaction to all 46 direct observations of exposure to sound levels of 95 to 102 dB. The authors could not extrapolate these data to predict long-term impacts (Lamp, 1989). Responses of bighorn sheep to low-level overflights (100 to 990 feet AGL) have included no response (Krausman and Hervert, 1983), accelerated heart rates (Workman and Bunch, 1991; MacArthur et al., 1982), and abandonment of the area (Lamp, 1987). Similarly, bighorn sheep exposed to sound levels of 89 to 98 dB exhibited no response 23 times, minor response four times, and major response (running) one time in a study of low-level jet overflight impacts to wildlife in Nevada. The authors could not extrapolate these data to predict long-term impacts (Lamp, 1989). Bighorn sheep populations at Luke AFB, Arizona and Nellis Air Force Range, Nevada showed no changes due to low-level flights (Lamp, 1989). Krausman et al. (1993a and 1993b) and Weisenberger et al. (1996) reported that heart rate and behavior of bighorn sheep and mule deer was altered for only a short period of time (less than three minutes) after exposure to jet aircraft noise over 100 dBA. These studies concluded that those temporary changes would not be detrimental to populations. Also supporting observational data, Weisenberger et al. (1996) suggested that interaction of noise with other environmental factors should be evaluated using free-ranging animals. Historic presence of big game in overflown areas also demonstrates that big game can exist in areas with low-level, military aircraft flights. As examples, mule deer and bighorn sheep populations continue to exist under airspace where low-level aircraft sorties have been flown for years at such training areas as Nellis Range, Nevada, and Goldwater Range, Arizona. A limited study of elk and pronghorn antelope response to overflight was conducted in Utah. Pronghorn overflown by F-16s at 5,000 to 5,500 feet above ground level (AGL) (74 dBA [A-weighted decibels]) and Cessna aircraft (500 feet AGL) had elevated heart rates. Heart rates decreased to preflight levels shortly after each aircraft overflight. Heart rate increases diminished with repeated overflight, suggesting acclimation. Elk overflown by F-16s at 500 to 600 feet AGL (103 dBA) exhibited similar heart rate increases and acclimation as the pronghorn (Hill AFB, 1992). Pronghorn in New Mexico ran from helicopter overflights 500 feet from the herd and generating a sound level of 77 dBA (Luz and Smith, 1976).

A study of bison response to low-level aircraft overflights was conducted in Colorado in June, 1994 (ANG/NGB, 1997). Three bison herds (a 2,200-head cow/calf herd, a small herd of two-year-old bulls in a feedlot, and a 500-head yearling herd) were overflown by F-16s between 300 and 1,500 feet AGL. The

cow/calf herd exhibited no response to overflight as low as 300 feet AGL. The bull herd exhibited minor to major response. The yearling herd exhibited major reaction (running) the single time it was overflown at 500 feet AGL; this reaction was thought to be partially influenced by reaction to the ground observers. The study also noted that other herds in proximity to airports or overflown by aircraft exhibited similar behavior as shown in this study.

Limited information on predator (e.g., wolf and mountain lion) response to low-level overflight is available. Klein (1973) stated that wolves reacted to overflight, but less than ungulates. Domestic dogs produced a large increase of plasma corticosteroids when exposed to sudden loud noises (Stephens, 1980), suggesting increased stress.

In general, it is expected that large mammal responses to aircraft overflight would range from no response to running and startle behavior. Some animals may have temporary increased production of plasma corticosteroids and may alter the size or use of home ranges. In addition, mule deer and pronghorn antelope present on McGregor Range may avoid or reduce use of the NTC and nearby area, especially when construction and maintenance crews are present, and when ordnance is expended.

Livestock. Few investigations have evaluated domestic animal responses to aircraft noise. Studies on various domestic animals suggest that animals can habituate to sound levels around 75 to 100 dB. Noise levels in excess of 100 dB for long periods have been reported to affect lamb growth rates, meat quality (adrenal-stress impact [Ames, 1974]), and other physiological processes (Ames and Arehart, 1972; Ames, 1978; Stephens, 1980). Exposure studies (Ames and Arehart, 1972) to intermittent noise levels in excess of 100 dB do not show the same consistent pattern as impacts from long periods of noise exposure. Kovalcik and Sottnik (1971) suggested that an 80 dB noise level was within dairy cows' normal tolerance. They reported that dairy cow feed intake was reduced, as was milk production, when exposed suddenly to 105 dB noise levels. However, gradual introduction of these noise levels did not result in as marked a decline. Parker and Bayley (1960) evaluated effects of aircraft noise on milk production of 182 dairy herds located within three miles of airbases over 12 months. The authors reported no effect to milk production.

Other studies have reported startle effects from low-altitude aircraft overflights (160 to 650 feet) (Nixon et al., 1968; Bond et al., 1974; Espmark et al., 1974). Cottereau (1978) reported large livestock responded to aircraft noise by sporadic jumping, galloping, vocalization, and random movement. Espmark et al. (1974) also reported stock jumped backwards when startled and suggested that impacts may be more severe in gestating animals. Casaday and Lehman (1966) reported some behavioral effect in racehorses due to jet aircraft flyovers. The reactions included jumping and galloping around, apparently fright reactions.

The potential effects of low-level flights on horses and cattle would likely result in short-term behavioral changes, ranging from simply looking at the aircraft

or vocalizing, to scattering over short distances (up to about 50 yards) and jumping. Casady and Lehman (1967) observed horse and beef cattle response in feedlots to sonic booms. They observed that reactions by horses were slight and included some jumping and galloping. The activity of beef cattle increased but was reduced after about 16 days, suggesting the animals acclimated to sonic booms. In a review of literature, Bell (1972) reported that beef cattle would scatter and run for 10 to 30 yards when exposed to sonic booms and then return to grazing. Bell (1972) also reported that reactions to low-flying aircraft were more pronounced compared to reactions to sonic booms and comparable to the reactions to the presence of strange objects or persons. A more recent study found that effects to brood mares from low-level aircraft flights was minor (Householder, 1996).

In summary, domestic livestock response to aircraft overflight would primarily include the potential of running, bucking, and startling. These reactions may result in damage to fences or injury to animals.

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2321 W. Royal Palm Road, Suite 103
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(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:
AESO/SE
2-21-97-I-180

March 19, 1997

Ms. Kate Bartz
Science Applications International Corporation
Division 203, Albuquerque Office
2109 Air Park Road, SE
Albuquerque, New Mexico 87106

RE: U.S. Air Force Replacement Training Unit

Dear Ms. Bartz:

This letter responds to your March 12, 1997, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project areas (Apache and Greenlee Counties). The attached lists may include candidate species as well. In the past, the U.S. Fish and Wildlife Service has provided project-specific species lists and information. However, staff reductions no longer permit us to provide this detailed level of assistance. We regret any inconvenience this may cause you and hope the enclosed county list of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-97-I-180.

The enclosed list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the enclosed list is the Code of Federal Regulations (CFR) citation for each listed or proposed species. Additional information can be found in the CFR and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed

critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or excavation in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please contact Tom Gatz.

Sincerely,

Sam F. Spiller
Field Supervisor

Enclosure

cc: Director, Arizona Game and Fish Department, Phoenix, AZ

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

18 AUG 1997

MEMORANDUM FOR U.S. Fish and Wildlife Service
Jennifer Fowler-Propst, Field Supervisor
Ecological Services
2105 Osuna Road NE
Albuquerque NM 87121

FROM: HQ ACC/CEVP
11817 Canon Blvd
Crestar Bank Building, Suite 500
Newport News VA 23606-2558

SUBJECT: Section 7 Consultation for Proposed Expansion of German Air Force (GAF) Operations at Holloman AFB, New Mexico

1. This is to confirm our meeting with Ms. Carol Torrez, Endangered Species Biologist for your office, on 20 Aug 97, at 8:00 a.m. The purpose of the meeting is to continue consultation on the above subject action. Those planning to attend from the Air Force include Mr. Roy Barker, HQ ACC Natural Resources Manager; Ms. Sheryl Parker, GAF Environmental Analysis Project Manager; Major Dave Adair, 49th OSS, and Mr. Rich Wareing, 49th CES/CEV.

2. Should you have any questions relating to the meeting or consultation, please contact Mr. Roy Barker at 757/764-9338.

Alton Chavis

ALTON CHAVIS
Chief, Conservation and Analysis Branch

COPY

United States Department of Agriculture | Forest Service | Apache-Sitgreaves NFs | P.O. Box 640
Springerville, AZ 85938-0640
(520) 333-4301
FAX: (520) 333-6537

File Code: 2670

Date: August 27, 1997

Jennifer Fowler-Propst
Field Supervisor
U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, NM 87113

Dear Ms. Fowler-Propst:

On August 21, 1997, we received a request from Jeff McCann of Science Applications International Corporation (SAIC) to provide SAIC with spacial information showing the distribution of federally listed species occurring on a portion of the Apache-Sitgreaves National Forests (Forest). Holloman Air Force Base (HAFB) has apparently contracted with SAIC to analyze the effects of changes in training flights originating from HAFB. The spacial information requested by SAIC is needed to properly evaluate these effects on various species.

In our discussions with Carol Torres, of your staff, we have been informed that SAIC has agreed that this spacial information can be sent directly to your office for subsequent use by SAIC in their analysis of effects. Enclosed are maps showing the general locations of federally listed and candidate species that may occur in the action area of the HAFB project. We have also enclosed a list of species that may be found on the Forest that includes federally listed, proposed or candidate species, and those species that have been identified as sensitive species by the Regional Forester. We encourage SAIC to consider all of those species identified on this list for the Alpine, Clifton and Springerville Ranger Districts in their analysis of effects. Sensitive species that warrant special consideration in the SAIC analysis of effects include the northern goshawk, zone-tailed hawk, common black-hawk and double-crested cormorant. All of these birds nest within the action area of the proposed project. Sensitive, aquatic species that should be evaluated include the narrowheaded garter snake, lowland leopard frog, speckled dace, and White Mountains water penny beetle.

We would also recommend that SAIC specifically consider the following in their analysis of effects:

1. The Mexican gray wolf is scheduled for reintroduction within the action area of the proposed action. We believe the analysis of effects by SAIC should consider this experimental, nonessential population.

2. Jaguars are now listed as endangered in the United States. The historic occurrence of transient jaguars in central Arizona, and the recent presence of jaguars in southern Arizona and New Mexico, indicate that this species needs to be considered by SAIC in their analysis of effects.

3. In addition to the single bald eagle nest site known within the action area of the proposed project, the species winters along the Blue River. Migrant bald eagles forage throughout the action area, feeding on carrion in the uplands, and fish and waterfowl along the major rivers, ponds, and reservoirs. The effects of low-level flights on migratory and nesting bald eagles should be evaluated.

4. SAIC should thoroughly investigate the effects of low-level flights on nesting and foraging peregrine falcons and Mexican spotted owls.

5. Aircraft have crashed in the vicinity of the Blue River. The statistical likelihood of this occurring is not known. However, such a mishap could release fuels, etc. into the Blue River, its tributaries or other aquatic environments. We believe the probability of such an event occurring, and its effects, should be considered by SAIC in their analysis of effects.

6. Although they are not protected under the Endangered Species Act, bighorn sheep may be impacted by low-level flights. We encourage SAIC to contact Region 1 of the Arizona Game and Fish Department (520-367-4342) to identify any concerns they may have regarding potential impacts to bighorn sheep.

If you have additional questions, please contact our rare species coordinator, Terry Myers, at 520-333-4301.

Sincerely,

JOHN C. BEDELL
Forest Supervisor

Enclosures

cc:
District Ranger, Alpine Ranger District
District Ranger, Clifton Ranger District
District Ranger, Springerville Ranger District
Field Supervisor, U.S. Fish and Wildlife Service, AESFO, Phoenix
Regional Supervisor, Region 1, Arizona Game & Fish Department, Pinetop
Ted Doerr, SAIC, Albuquerque

APACHE-SITGREAVES NATIONAL FORESTS
ENDANGERED, THREATENED, PROPOSED, CANDIDATE, AND SENSITIVE SPECIES
Date of FWS Concurrence: 12/10/96 Most Recent Edit: 09/18/96

(Ranger Districts: 01 Alpine; 03 Clifton; 04 Chevelon; 05 Heber; 06 Springerville; 07 Lakeside)

Species	USFWS and USFS Status	Critical Habitat Proposed/ Assigned	S=Sp. present; B=Breeding documented; S?=Specis not documented but may occur; S*=Historic presence, likely extirpated; H=Proposed/Critical Habitat present. 01	03	04	05	06	07
MAMMALS								
Bassariscus astutus Ringtail	SEN		S	S	S?	S?	S	S?
Canis lupus baileyi Mexican gray wolf	E/SEN	No	E...X...T...I...R...P...A...T...E...D					
Choeronycteris mexicana Mexican long-tongued bat	SEN			S?				
Euderma maculatum Spotted Bat	SEN		S	S?	S?	S?	S?	S?
Eumops perotis californicus Greater western mastiff bat	SEN			S?				
Lasiurus blossevillii Red bat (= L. borealis in part)	SEN			S?				
Leptonycteris curasoae yerbabuena Lesser long-nosed bat	E/SEN	No		S?				
Lutra canadensis sonorae Southwestern otter	SEN		S?	S?			S?	
Macrotus californicus California leaf-nosed bat	SEN			S?				
Microtus montanus arizonensis Arizona montane vole	SEN		S	S?			S	S
Mustela nigripes Black-footed ferret	E/SEN	No	S?		S?	S?	S?	S?
Myotis lucifugus occultus Occult little brown bat	SEN		SB	S?	SB	S	S?	S
Myotis velifer Cave myotis	SEN			S				
Nasua nasua Coati	SEN		S?	S	S	S?	S?	S
Notiosorex crawfordi Desert shrew	SEN		S?	S	S?	S?	S?	S
Ovis canadensis nelsoni Rocky Mountain bighorn sheep	SEN		SB	SB			SB	
Panthera onca Jaguar	E ~~PE~~/SEN		Transients from Mexico possible					
Perognathus flavus goodpasteri Silky pocket mouse	SEN		S?	S?		S?	S?	S
Plecotus townsendii pallescens Pale Townsend's (Western) big-eared bat	SEN		S?	S?	S?	S?	S?	S?
Sorex palustris navigator Northern water shrew	SEN		S	S?			S	S?
Spermophilus tridecemlineatus monticola White Mountains ground squirrel	SEN		S				S	
Tadarida brasiliensis Mexican free-tailed bat	SEN		S	S	S?	S	S?	S?
Zapus hudsonius luteus New Mexican (meadow) jumping mouse	SEN		S	S?			S	S?
BIRDS								
Accipiter gentilis Northern Goshawk	SEN		SB	SB	SB	SB	SB	SB
Accipiter striatus Sharp-shinned Hawk	SEN		S	S	S	S	S	S
Botaurus lentiginosus American Bittern	SEN		S				S	S
Buteo albonotatus Zone-tailed Hawk	SEN		S	SB	S	SB	S	S
Buteogallus anthracinus Common Black-hawk	SEN		SB	SB	S	S		
Buteo regalis Ferruginous Hawk	SEN		S	S	S	S	S	S
Buteo swainsoni Swainson's Hawk	SEN		S	S	S	S	S	S
Butorides striatus Green-backed Heron	SEN			S				
Casmerodius albus Great Egret	SEN		S	S?	S?	S?	S?	S
Catharus fuscescens Veery	SEN		S?				S	
Ceryle alcyon Belted Kingfisher	SEN		S	S	S	S	S	S?
Charadrius montanus Mountain Plover	C/SEN		S?				S?	S?
Coccyzus americanus occidentalis Yellow-billed Cuckoo	SEN			S				
Dolichonyx oryzivorus Bobolink	SEN						S?	S?
Dumetella carolinensis Gray Catbird	SEN		S	S			S	
Egretta thula Snowy Egret	SEN		S	S?	S?	S?	S?	S
Empidonax traillii extimus Southwestern Willow Flycatcher	E/SEN	~~Proposed~~ Assigned	SB	S?	S?	S?	SBH	S?
Falco mexicanus Prairie Falcon	SEN		SB	S	S?	S?	SB	S
Falco peregrinus anatum American Peregrine Falcon	E/SEN	No	SB	SB	SB	SB	SB	S
Haliaeetus leucocephalus Bald Eagle	T/SEN	No	SB	S	S	S	S	S
Himantopus mexicanus Black-necked Stilt	SEN		S?	S?	S?	S?	S?	S

will be withdrawn on 10/01/96

Species	USFWS and USFS Status	Critical Habitat Proposed/ Assigned	01	03	04	05	06	07
			S=Sp. present; B=Breeding documented; S?=Specis not documented but may occur; S*=Historic presence, likely extirpated; H=Proposed/Critical Habitat present.					
BIRDS (continued)								
Numenius americanus Long-billed Curlew	SEN		S?	S?			S	S?
Nycticorax nycticorax Black-crowned Night Heron	SEN		SB	S	S?	S?	SB	SB
Otus flammeolus Flammulated Owl	SEN		S	S	SB	S	S	S
Pandion haliaetus carolinensis Osprey	SEN		SB	S	S?	S?	SB	SB
Passerina versicolor Varied Bunting	SEN			S?				
Pelecanus occidentalis Brown Pelican	E/SEN	No	S					
Phalacrocorax auritus Double-crested Cormorant	SEN		SB	S?	S?	S?	S?	SB
Pinicola enucleator Pine Grosbeak	SEN		S		S?	S?	S	S?
Plegadis chihi White-faced Ibis	SEN		S	S?	S?	S	S	S
Porzana carolina Sora	SEN		S?	S?	S	S?	S	S
Recurvirostra americana American Avocet	SEN		S?	S?	S?	S?	S?	SB
Rhynchopsitta pachyrhyncha Thick-billed Parrot	SEN			S?	S?	S?		
Setophaga ruticilla American Redstart	SEN		S?				S	
Strix occidentalis lucida Mexican Spotted Owl	T/SEN	Assigned	SBH	SH	SBH	SBH	SBH	SH
Vireo belli Bell's vireo	SEN			S				
Vireo vicinior Gray Vireo	SEN			S	S?	S?		S?
REPTILES								
Heloderma suspectum Gila monster	SEN			S				
Thamnophis rufipunctatus Narrowheaded garter snake	SEN		S	S	S	S?	S?	S?
AMPHIBIANS								
Rana chiricahuensis Chiricahua leopard frog	C/SEN		S	S	S?	S?	S*	S*
Rana pipiens Northern leopard frog	SEN		S?		S?	S	S*	S*
Rana yavapaiensis Lowland leopard frog	SEN			S				
FISHES (All "S" assumed breeding)								
Gila intermedia Gila chub	SEN			S				
Gila robusta Roundtail chub (04,05: present in Chev. Can. below dam)	SEN		S	S	S	S	S	S*
Lepidomeda vittata Little Colorado spinedace (04,05: present off-Forest in Chevelon Can.)	T/SEN	Assigned.	S		S?	S?	SH	EXTIRP
Meda fulgida Spikedace. No critical habitat designated on the Forest.	T/SEN	Assigned.		S				
Oncorhyncus apache Apache trout	T/SEN	No	S				S	
Pantosteus discobolus Bluehead sucker	SEN		S		S	S?	S	S*
Rhinichthys osculus osculus Speckled dace	SEN		S	S	S	S	S	S
Tiaroga cobitis Loach minnow	T/SEN	Assigned.	SH	SH			S?	
Xyrauchen texanus Razorback sucker. No critical habitat designated on the Forest.	E/SEN	Assigned.	S?	S?				
INSECTS								
Ameletus falsus False ameletus mayfly	SEN		S?				S	
Limenitis archippus obsoleta Obsolete viceroy butterfly	SEN			S?				
Psephenus montanus White Mountains water penny beetle	SEN		S				S	
Speyeria nokomis nitocris Mountain silverspot butterfly	SEN		S	S?	S	S?	S	S?

Critical Hab. has been withdrawn

Critical Habitat has been withdrawn

Species	USFWS and USFS Status	Critical Habitat Proposed/Assigned	S=Sp. present; B=Breeding documented; S?=Specis not documented but may occur; S*=Historic presence, likely extirpated; H=Proposed/Critical Habitat present. 01	03	04	05	06	07
PLANTS								
Allium gooddingii Gooding onion	C/SEN		S	S			S	
Astragalus nutriosensis Nutrioso milk vetch	SEN		S?				S	
Castilleja mogollonica Mogollon paintbrush	SEN						S	
Cimicifuga arizonica Arizona bugbane. Per B. Palmer, FWS, is retained on this list but will not need to be considered in biological assessments and evaluations	C/SEN		????	????	????	????	????	????
Draba standleyi Standley Whitlow-grass	SEN						S?	
Echinocereus triglochidiatus var. arizonicus Arizona hedgehog cactus	E/SEN	No		S				
Erigonum capillare San Carlos wild buckwheat	SEN			S?				
Puccinellia parishi Parish alkaligrass	PE			S				
Rumex orthoneurus Blumer's dock	C/SEN		S	S?	S	S?	S	S?
Salix arizonica Arizona willow	SEN						S	
Senecio quaerens Gila groundsel	SEN		S	S?			S	
Talinum humile Pinos Altos flame flower	SEN		S?					
Toumeya papyracantha Paper-spined cactus	SEN				S?	S		S

APACHE-SITGREAVES NATIONAL FORESTS
LIST OF
SPECIES OF CONCERN

These species were formerly designated as Category 2 candidates by the USFWS. As of February 28, 1996, none of these species have "candidate" status with the USFWS per Fed. Reg. 61(40):7595-7613. In addition, none of these species have been designated by the Regional Forester as sensitive species. There is no direction or requirement to address these species in biological assessments and evaluations prepared by the Forest Service (FSM 2670.4).

(Ranger Districts: 01 Alpine; 03 Clifton; 04 Chevelon; 05 Heber; 06 Springerville; 07 Lakeside)

Species	Former FWS Status	S=Sp. documented; B=Breeding documented; S?=Species not documented but may occur; S*=Historic presence, likely extirpated. 01	03	04	05	06	07
MAMMALS							
Idionycteris phyllotis Allen's (Mexican) big-eared (lappet-browed) bat	C2	SB	S?	SB	SB	S	S?
Myotis ciliolabrum Small-footed myotis	C2	S	S	SB	S?	S?	S?
Myotis evotis Long-eared myotis	C2	SB	S?	SB	SB	S?	S?
Myotis thysanodes Fringed myotis	C2	SB	S	SB	SB	S?	S?
Myotis volans Long-legged myotis	C2	SB	SB	SB	S	S?	S?
Myotis yumanensis Yuma myotis	C2		S	S?	S		S?
Nyctinomops(=Tadarida) macrotis Big free-tailed bat. According to Petryzyn and Sidner (1994) this species may occur in drier forest areas of the ASNF	C2	S?	S?	S?	S?	S?	S?
BIRDS							
Lanius ludovicianus Loggerhead Shrike	C2	S?	S	S?	S?	S?	S?
AMPHIBIANS							
Bufo microscaphus microscaphus Arizona southwestern toad	C2	S	S	S?	S?	S?	S
FISHES (All "S" assumed breeding)							
Agosia chrysogaster Longfin dace	C2	S	S				
Catostomus sp. Little Colorado sucker	C2	S		S	S	S	S*
Catostomus insignis Sonora (Gila) sucker	C2	S	S			S	
Pantosteus clarki Desert (Gila mountain) sucker	C2	S	S			S	
CLAMS AND MUSSELS							
Anodonta californiensis California floater	C2	S	S?	S	S	S	S?
SNAILS							
Discus shemeki cockerelli Cockerell's striate disc snail	C2	S?	S?	S?	S?	S?	S?
Pyrgulopsis (Pontelicella) trivialis. Three Forks springsnail	C2	S					
PLANTS							
Erigeron anchana Mogollon fleabane	C2			S?	S?		
Gentianella wislizeni Wislizeni's gentianella	C2	S	S?			S?	
Trifolium longipes var. _neurophyllum_ White Mountains clover	C2	S				S	

MODIFICATIONS MADE TO APACHE-SITGREAVES SPECIES LIST MADE SINCE 2/1/95

2/27/95: Southwestern Willow Flycatcher listed as endangered.

3/27/95: Correct spelling of Vireo vicinior and Senecio quaerens.

3/28/95: Add breeding status of Prairie Falcon to 01 (Foote Creek) and 06 (Mt. Baldy)
Add Nasua nasua sighting to 04.

5/01/95: Add Casmerodius albus and Egretta thula on 01: observed at Luna Lake.
Add breeding status to Phalacrocorax auritus on 01: nesting at Tenney Pond & feeding at Luna Lake
Add confirmed Speyria nokomis nitocris on 01, 04, 06 based on USFWS info given to Forest.
Correct Toumeya papyracantha nomenclature based on Sivinski and Lightfoot (1994)

5/30/95: Add Brown Pelican based on 5/27/95 sighting at Luna Lake (01).
Add Xyrauchen texanus to 01 based on stocking records, etc. in Hendrickson report.

5/31/95: Change status of Salix arizonica from PE to 3C (Fed. Reg. 60(82):20951-20952).

6/06/95: Change status of Mexican Spotted Owl critical habitat to ASSIGNED (Fed. Reg. 60(108):29914ff).

7/28/95: Add Allium gooddingii to 03 (Squirrel Canyon).

9/06/95: Change status of Bald Eagle to Threatened (Fed. Reg. 60(133):36000-36010).

10/04/95: -Ovis canadensis status changed to SB; Nycticorax nycticorax observed at Luna Lake (01) and SB populations on Nelson Reservoir are on 01;
-A recent biological assessment prepared by the Southwestern Region (FS) and concurred with by the US Fish & Wildlife Service reported the extirpation of Lepidomeda vittata from Silver Creek and its tributaries. Therefore, the status of this species on 07 is now changed to Extirpated.
-Status of Xyrauchen texanus on 01 and 03 changed to S? because recent fish sampling did not reveal any evidence of previously (1980's) stocked adults or any reproduction. Portions of the Blue and San Francisco Rivers will still be condsidered as potentially occupied by this species until the ongoing fish survey is completed and all data can be evaluated.
-All "S" fish species assumed to be breeding.
-Add Osprey to 04.
-Add Bell's Vireo to 03 (San Francisco River) based on Carrothers et al. (1982).

10/07/95: Fragments of Anodonta californiensis found at Roundy Crossing (Show Low Creek) on 07. Probably prehistoric shells, but may indicate presence in perennial reaches upstream of site (Myers). Anodonta shells have been found at archeological excavations near Pinedale (07) recently.

10/19/95: -Roadkill ringtail reported (8/95) at Forest boundary on FR 261 (04 Baldanado).
-Idionycteris phyllotis trapped at White Mtn Hereford Ranch in building by AGFD (06).
-Belted Kingfisher with fledglings on Willow Creek (04 Mehling) 6-7/95.

11/03/95: Add Echinocereus triglochidiatus to 03 based on information collected by SWCA for BLM/ Phelps Dodge land exchange survey work performed on Clifton RD (S. Mills, SWCA, pers. comm.). Subspecies (var. arizonicus) is assumed for plants on 03 pending results of ongoing genetic work from the University of Arizona (per Angie Brooks, FWS).

12/07/95: Change status of Microtus montanus arizonensis from S? to S on 07 based on HDMS (EOR no. 22) record from Telephone Springs.

03/05/96: Change status of candidate species based on proposed rule published in Fed. Reg. Vol 61(4): 7595-7613 (February 28, 1996). Create "Species of Concern" list per as discussed with L. Wada, USFWS, Phoenix.

03/25/96: FWS CONCURRENCE

04/11/96: -Based on Round River Report: Sighting on 03 of Buteo regalis, Butorides striatus, Dumatella carolinensis, Falco mexicanus, Lanius ludovicianus, Pandion haliaetus, Vireo vicinior
-Based on identification of photos of frogs on Blue River and tributaries (03) by James Platts: add Rana chiricahuensis (Fritz Canyon, Blue River between Fritz Canyon and Stacey Crossing, Thomas Creek).

04/12/96: -Add narrowheaded garter snake to 06 based on report by B. Vahle of specimen observed in Rudd Creek on AGFD Sipes Ranch. Rudd Creek flows from 06 land through AGFD property and then back through 06 land where it meets Nutrioso Creek in Little Colorado River drainage.
-Add "S*" status to Chiricahua leopard frog (06, 07), northern leopard frog (06, 07), roundtail chub (07), bluehead sucker (07), Little Colorado sucker (07). Discuss these changes with Sally Stefferud and Jim Rorabaugh (FWS). They support this classification as a means of tracking.
-Re-alphabetize Canis lupus baileyi and Bassariscus astutus.

05/16/96: Change "S" designation for narrowheaded garter snake on 06 back to "S?" based on determination by Mike Sredl (AGFD, Phoenix) that Vahle's snake was a wandering garter snake (photo documentation).

06/15/96: Add Loach minnow (Tiaroga cobitis) to 06 as S? based on 6/12 collection of species from N.Fork E. Fork Black River near Three Forks by ASU.

09/06/96: Add Yellow-billed Cuckoo (Coccyzus americanus occidentalis) and San Carlos wild buckwheat (Eriogonum capillare) to 03 on basis of Hubbard (1972), AGFD HDMS Element Occurrence Handbook (1994).
-Delete Black-footed ferret (Mustela nigripes) from 03 because no prairie dogs occur on District.
-Delete Northern leopard frog (Rana pipiens) from 03 because no historical records and District is not within range of species.

09/18/96: Change "S?" to "S" for silky pocket mouse (Perognathus flavus goodpasteri) on 07 based on collection of individuals by D. Klein in 1996, and verification by Yar Petryszyn (Univ Ariz).

05/27/97: Bats netted at 03: Antrozous pallidus; Myotis thysanoides; Myotis volans; Myotis californicus; Myotis ciliolabrum; Myotis occultus; Myotis auriculus; Pipistrellus hespurus; Eptesicus fuscus; Lasionycteris noctivagans.

--/--/97: Peregrine Falcon eyrie on 03

MEMORANDUM FOR U.S. Fish and Wildlife Service
Ms Jennifer Fowler-Propst, Field Supervisor
Ecological Services
2105 Osuna Road NE
Albuquerque NM 87121

FROM: HQ ACC/CEVP
129 Andrews St, Suite 102
Langley AFB VA 23665-2769

SUBJECT: Endangered Species Act Section 7 Consultation

1. This is to update you on the status of the U.S. Air Force's (USAF) consultation efforts regarding the proposed beddown of German Air Force (GAF) aircraft and USAF use of existing airspace in New Mexico.

2. As you will recall, there are several separate consultations taking place:

- Informal consultation on proposed operations on Military Training Route (MTR) 102/141 and Talon Military Operating Area (MOA) - We previously submitted the concurrence letter to you on 22 Aug 97. In it we concluded that proposed operations may affect, but are unlikely to adversely affect, listed species. Since your receipt of that document, you expressed concerns relative to the aplomado falcon at our 20 Aug 97 meeting. In the very near future we will be providing for your concurrence additional information and our evaluation of the potential effects to the aplomado falcon from use of these airspaces.

- Informal consultation on existing operations on MTRs 133, 134/195, and 192/194 - This office is preparing the concurrence letter as mutually agreed upon during our 20 aug 97 meeting. We have only recently received complete information on listed species in these areas. At this point, our preliminary analysis indicates that existing operations may affect, but are unlikely to adversely affect, listed species. We will send this consultation document to you by mid-October.

- Informal consultation on existing operations on MTRs 113, 100/125, and Pecos Low MOA - The concurrence letter is under preparation by Cannon Air Force Base (AFB) environmental staff. The base has only recently received complete information on listed species in these areas. At this point, our preliminary analysis indicates that existing operations may affect, but are unlikely to adversely affect, listed species. Cannon AFB will send this consultation document to you before the end of October.

- Consultation on the proposed GAF beddown - During a 20 Aug 97 meeting, Ms Torrez reported that, after review of the Draft EIS for this project, it would be the FWS' position that formal consultation is necessary. Consequently, we discussed the scope of the Biological Assessment (BA) in terms of proposed activities and listed species. It was

agreed that the scope of the BA will focus on use of airspace and construction/use of a new target complex (NTC) on Otero Mesa. It was also agreed that construction activities and operations at Holloman AFB would not affect listed species based on three considerations: (1) construction and operations would not occur on occupied or potential habitat (i.e., construction would occur on previously-disturbed areas within or adjacent to the cantonment area); (2) the proposed construction and operations will not create off-site impacts that would affect occupied or potential habitat (e.g., water discharge into sewage lagoon G) or listed species known to occur in the area; and; (3) the proposed activities at Holloman AFB are similar to current activities there. During that same meeting, we discussed the consultation process for existing and proposed use of VR-176. The options discussed included conducting a single consultation on existing and proposed use by GAF and USAF, and existing use by the Air National Guard (ANG), or conducting separate consultations: one by the ANG for its existing use, and one by this office for both existing and proposed GAF and USAF use. Since that meeting, USAF and ANG have agreed to take the FWS' recommendation and conduct a single consultation. Our BA will focus on the following species: peregrine falcon, southern bald eagle, southwestern willow flycatcher, northern aplomado falcon, Mexican spotted owl, whooping crane, and Mexican wolf. We will send you the BA by mid-November.

3. We understand your concern that this consultation be completed prior to the 1998 raptor nesting season, and assure you that we also hope to conclude this consultation by that time. To help us meet that goal, we would appreciate your immediately contacting the Air Combat Command Natural Resources Manager, Mr Roy Barker, whenever you have questions or comments on the progress of this consultation. Also, if we have mischaracterized your position on any of these matters, please inform us by immediate reply. Mr Barker can be reached by phone at (757) 764-9338, or by e-mail at barkerr@hqaccc.langley.af.mil.

United States Department of Agriculture

Forest Service

Apache-Sitgreaves NFs

P.O. Box 640
Springerville, AZ 85938
520 333-4301

Reply To: 1900

Date: July 18, 1997

Ms. Sheryl Parker, Project Manager
Headquarters Air Combat Command/CEVA
129 Andrews Street
Langley AFB, VA 23665-2769

Dear Ms. Parker:

The Apache-Sitgreaves National Forests have been contacted by Mr. Ted Doerr and asked to provide comment to the Draft EIS for "Proposed Expansion of German Air Force Operations at Holloman AFB, New Mexico". Specifically we were asked to provide species impact information and avoidance recommendations for use along VR-176 within the Apache Forest. We would also like to provide location information on areas of concentrated public use and fire related facilities, along with appropriate avoidance margins.

Please find enclosed species lists for both the Alpine and Clifton Ranger Districts giving occurrence and status for various TE&S species. Also enclosed are lists of facilities and areas of public use and recommended avoidance distances and also maps depicting these locations.

You should also be aware that the Fish and Wildlife Service will be releasing endangered Mexican Wolves in several still undetermined locations adjacent to the Blue Range Primitive Area in the spring of 1998.

While the Blue Range Primitive Area does not have any flight elevation restrictions due to its incorporation in the National Wilderness System, it is customary for aircraft to observe a minimum 2000 foot above ground level altitude while over these areas. We ask that this training program observe this to the extent possible for as you can see there are numerous areas of public use and TE&S species habitats.

If we can provide further information or assistance we will be happy to do so.

Sincerely,

for JOHN C. BEDELL
Forest Supervisor

Enclosures

Areas to be Avoided by Air Force Training Flights

Apache-Sitgreaves NF's
Clifton Ranger District

<u>Fire Management facilities to be avoided:</u>

Rose Peak Lookout	T1N R29E Sec. 8	by .5NM
Strayhorse Admin Site	T2N R29E Sec. 2	by .5NM
Strayhorse Helispot	T2N R29E Sec. 11	by .5NM

<u>Other Facilities to be avoided:</u>

Strayhorse Campground	T2N R29E Sec. 2	by .5NM
Trail Cabin Admin. Site	T2S R29E Sec. 16	by .5NM

<u>TES species locations to be avoided:</u>

Bringham Peak	T1N R29E Sec. 9, 10	by 1NM
Yam Canyon	T2N R32E Sec. 30,	by 1NM
Blue River Corridor	T1N R31E Sec. 6, 7, 12, 13, 18, 24, 25, 31, 36	by 1NM
Blue River Corridor	T1S R31E Sec. 5, 8, 17, 18, 19, 20, 30, 31	by 1NM
Blue River Corridor	T2S R31E Sec. 5, 7, 25, 36	by 1NM

USAF TRAINING ROUTE 176

CLIFTON RANGER DISTRICT
APACHE-SITGREAVES NATIONAL FORESTS
ENDANGERED, THREATENED, PROPOSED, CANDIDATE, AND SENSITIVE SPECIES
Date of FWS Concurrence: 12/10/96
Most Recent Edit: 12/10/96

Species	USFWS and USFS Status	STATUS OF SPECIES/HABITAT IN ACTION AREA (AA) OF PROPOSED PROJECT (a) Critical habitat present in AA (b) Species or habitat present in AA (c) Neither species nor habitat in AA
MAMMALS		
Bassariscus astutus Ringtail	SEN	(b) Inhabits canyons and riparian areas
Canis lupus baileyi Mexican gray wolf	E/SEN	(b) Residents extirpated; 1998 Reintroduction planned for action area
Choeronycteris mexicana Mexican long-tongued bat. According to Barry Spicer, AGFD, this species might occur on 03.	SEN	(b) May occur in mines, caves in action area
Euderma maculatum Spotted Bat	SEN	(b) Riparian, water with nearby cliffs
Eumops perotis californicus Greater western mastiff bat	SEN	(b) Cliffs with potential roost sites near water
Lasiurus blossevillii Red bat (= L. borealis in part)	SEN	(b) Inhabits riparian (cottonwood, sycamore) areas
Leptonycteris curasoae yerbabuena Lesser long-nosed bat. According to Barry Spicer, AGFD, this species might occur on 03. Yar Petryszyn, UA, believes it highly unlikely to occur anywhere on the Forest	E/SEN	(b) May occur in paniculate agave areas in lower elevations
Lutra canadensis sonorae Southwestern otter. According to Bruce Palmer, FWS, this species may still occur in the headwaters of the Salt River drainage system	SEN	(c) Recent surveys did not detect species
Macrotus californicus California leaf-nosed bat	SEN	(b) May occur where mines/caves exist
Microtus montanus arizonensis Arizona montane vole	SEN	(b) May occur in high elevation coniferous forests and riparian areas
Mustela nigripes Black-footed ferret. According to Bill Vanpelt, AGFD ferret specialist, this species may still occur on the Forest in association with prairie dogs	E/SEN	(c) No prairie dogs in action area
Myotis lucifugus occultus Occult little brown bat	SEN	(b) Inhabit cottonwood-sycamore habitats
Myotis velifer Cave myotis	SEN	(b) Inhabit riparian galleries
Nasua nasua Coati	SEN	(b) Inhabit riparian woodlands (sycamore, walnut).
Notiosorex crawfordi Desert shrew	SEN	(b) May occur in riparian areas
Ovis canadensis nelsoni Rocky Mountain bighorn sheep	SEN	(b) Documented in action area
Panthera onca Jaguar	PE/SEN	(b).Transients from Mexico possible
Perognathus flavus goodpasteri Silky pocket mouse	SEN	(b) May occur in juniper/desert grasslands
Plecotus townsendii pallescens Pale Townsend's (Western) big-eared bat	SEN	(b) May roost in adjacent cliffs and feed at river
Sorex palustris navigator Northern water shrew.	SEN	(b) May occur in high elevation streams
Tadarida brasiliensis Mexican free-tailed bat	SEN	(b) Inhabit riparian cottonwood galleries
Zapus hudsonius luteus New Mexican (meadow) jumping mouse	SEN	(b) May occur in high elevation streams

Species	USFWS and USFS Status	STATUS OF SPECIES/HABITAT IN ACTION AREA (AA) OF PROPOSED PROJECT (a) Critical habitat present in AA (b) Species or habitat present in AA (c) Neither species nor habitat in AA
BIRDS		
Accipiter gentilis Northern Goshawk	SEN	(b) Occurs ponderosa pine, mixed conifer forests
Accipiter striatus Sharp-shinned Hawk	SEN	(b) May nest/forage in ponderosa pine/riparian
Buteo albonotatus Zone-tailed Hawk	SEN	(b) May nest or forage along rivers
Buteogallus anthracinus Common Black-hawk	SEN	(b) Documented nesting along Blue River
Buteo regalis Ferruginous Hawk	SEN	(b) May occur in grasslands and open country
Buteo swainsoni Swainson's Hawk	SEN	(b) May occur in grasslands and open country
Butorides striatus Green-backed Heron	SEN	(b) May transiently forage in backwaters/Blue R...
Casmerodius albus Great Egret	SEN	(b) May transiently forage along Blue River
Ceryle alcyon Belted Kingfisher	SEN	(b) Forages along Blue River
Coccyzus americanus Yellow-billed Cuckoo	SEN	(b) May inhabit riparian thickets along Blue River
Dumetella carolinensis Gray Catbird	SEN	(b) May occur in woody riparian
Egretta thula Snowy Egret	SEN	(b) May transiently forage along river
Empidonax traillii extimus Southwestern Willow Flycatcher	E/SEN	(c) No suitable habitat
Falco mexicanus Prairie Falcon	SEN	(b) May forage along river; No known eyries in AA.
Falco peregrinus anatum American Peregrine Falcon	E/SEN	(b) May forage along river; No known eyries in AA.
Haliaeetus leucocephalus Bald Eagle	T/SEN	(b) Documented wintering birds along Blue River
Himantopus mexicanus Black-necked Stilt	SEN	(b) May occur in backwater/marshy areas
Numenius americanus Long-billed Curlew	SEN	(c) No grasslands
Nycticorax nycticorax Black-crowned Night Heron	SEN	(b) May transiently forage along river/backwaters.
Otus flammeolus Flammulated Owl	SEN	(b) May occur in ponderosa pine forests/stringers.
Pandion haliaetus carolinensis Osprey	SEN	(b) May transiently forage along river
Passerina versicolor Varied Bunting	SEN	(b) May inhabit mesquite thickets along Blue River
Phalacrocorax auritus Double-crested Cormorant	SEN	(c) No nesting colonies; No deep-water habitat
Plegadis chihi White-faced Ibis	SEN	(b) May transiently forage along river bank
Porzana carolina Sora	SEN	(c) No extensive marshes
Recurvirostra americana American Avocet	SEN	(c) No shallow wetlands with open flats
Rhynchopsitta pachyrhyncha Thick-billed Parrot	SEN	(b) May occur in coniferous habitats
Strix occidentalis lucida Mexican Spotted Owl	T/SEN	(b) May transiently forage along river/tributaries
Vireo belli Bell's vireo	SEN	(b) May inhabit riparian mesquite thickets
Vireo vicinior Gray Vireo	SEN	(b) May inhabit mesquite/willow along rivers
REPTILES		
Heloderma suspectum Gila monster	SEN	(b) Occurs in lower elevation desertscrub
Thamnophis rufipunctatus Narrowheaded garter snake	SEN	(b) Documented in Blue River
AMPHIBIANS		
Rana chiricahuensis Chiricahua leopard frog	C/SEN	(b) Inhabits backwaters/ponds, Blue River
Rana pipiens Northern leopard frog	SEN	(b) May occur in higher elevation streams/ponds...
Rana yavapaiensis Lowland leopard frog	SEN	(b) Inhabits Blue River backwaters/ponds

Species	USFWS and USFS Status	STATUS OF SPECIES/HABITAT IN ACTION AREA (AA) OF PROPOSED PROJECT (a) Critical habitat present in AA (b) Species or habitat present in AA (c) Neither species nor habitat in AA
FISHES		
Gila intermedia Gila chub	SEN	(c) Species does not now inhabit river
Gila robusta Roundtail chub	SEN	(c) Species does not now inhabit river
Meda fulgida Spikedace. No critical habitat designated on the Forest.	T/SEN	(c) Species does not now inhabit river
Rhinichthys osculus osculus Speckled dace	SEN	(b) Species inhabits Blue River/tributaries
Tiaroga cobitis Loach minnow	T/SEN	(b) Species inhabits Blue River
Xyrauchen texanus Razorback sucker. No critical habitat designated on the Forest.	E/SEN	(b) Introduced, non-breeding adults may persist in Blue River
INSECTS		
Limenitis archippus obsoleta Obsolete viceroy butterfly	SEN	(b) May inhabit cottonwood/willow habitats
Speyeria nokomis nitocris Mountain silverspot butterfly	SEN	(b) May occur in wet meadows seasonally
PLANTS		
Allium gooddingii Goodding onion	C/SEN	(b) May occur in high elevation riparian/m.conifer
Echinocereus triglochidiatus var. arizonicus Arizona hedgehog cactus	E/SEN	(b) May occur in lower elevation PJ/brush/rock
Eriogonum capillare San Carlos Buckwheat	SEN	(b) May occur along sandy/gravelly riverbanks
Puccinellia parishi Parish alkaligrass	PE	(c) No alkaline/saline springs
Rumex orthoneurus Blumer's dock	C/SEN	(b) May occur in Forest riparian
Senecio quaerens Gila groundsel	SEN	(b) May occur in Forest riparian

Fire Managment facilites to be avoided:

Escudilla Lookout	6N, 31E, NE Sec. 6	by .5 NM
Alpine Heliport	5N, 31E, WC Sec. 7	by .5 NM
Hannagan Heliport	3N, 29E, EC Sec. 3	by 3 NM or 1,500 AGL *
Blue Camp Heliport	3N, 31E, Sec. 15/22	by .5 NM
Bear Mnt. Lookout	2N, R31e, NW Sec. 9	by .5 NM

* = Hannagan Heliport to be treated as an airport

Campgrounds to be avoided:

Luna Lake	5N, 31E, SW Sec. 9	by .5 NM
Upper Blue	4N, 32E, NE Sec. 18	by .5 NM
Blue Crossing	3N, 31E, SE Sec. 2	by .5 NM

TES species locations of critical concern:

Milligan Peak	4N, 31E, Sec. 1 & 12	by 1 NM
Castle Rock	4N, 30E, Sec. 26	by 1 NM
Red Hill	4N, 31E, Sec. 21	by 1 NM
Sawed Off Mtn.	3N, 30E, Sec. 29 & 30	by 1 NM
Bear Mtn.	2N, 31E, Sec. 3, 4, 5, 8, 9 & 10	by 1 NM
Luna Lake	5N, 31E, Sec. 8, 9, 16 & 17	by 1 NM

NOTE: Some areas are listed in more than one administrative category. All radius avoidance distance recommendations are horizontal. The wider radius of avoidance will take precidence in these cases.

APACHE-SITGREAVES NATIONAL FORESTS
ALPINE RANGER DISTRICT
LIST OF
ENDANGERED, THREATENED, PROPOSED, CANDIDATE, AND SENSITIVE SPECIES

On 12/10/96 the U.S. Fish & Wildlife Service concurred that the listed, proposed, and sensitive species on this list may be present on the Alpine Ranger District. The Table below considers all of these species, and identifies which of them may be present in the action area of Visual Route 176 (USAF) based on known occurrance records or the availability of suitable habitat. Legend - Status: E = endangered, T = threatened, PE = proposed endangered, Sen = Forest Service Region 3 sensitive. S = Species occurs, S? = Species may occur, CH or PCH = Critical Habitat or Proposed Critical Habitat.

Species	USFWS and USFS Status	District Species Status	Species Status in Action Area of Proposed Project		
			CH or PCH	Known to Occur	Not Documented but Habitat is Present
MAMMALS					
Canis lupus baileyi Mexican gray wolf	E/SEN	-	No	Extirpated	Re-introduction planned in 1998
Bassariscus astutus Ringtail	SEN	S		YES - Breeding	
Euderma maculatum Spotted Bat	SEN	S		YES	Forests, cliffs, foraging
Lutra canadensis sonorae Southwestern otter	SEN	S?			YES - Blue River
Microtus montanus arizonensis Arizona montane vole	SEN	S			YES - High elevation forests
Mustela nigripes Black-footed ferret	E/SEN	S	No		No - No prairie dogs present
Myotis lucifugus occultus Occult little brown bat	SEN	S		YES	Forests, woodland, foraging
Nasua nasua Coati	SEN	S?		YES - Breeding	
Notiosorex crawfordi Desert shrew	SEN	S?			YES - Arid woodlands
Ovis canadensis nelsoni Rocky Mountain bighorn sheep	SEN	S		YES - Breeding	
Panthera onca Jaguar	PE/SEN		No		Transients from Mexico possible
Perognathus flavus goodpasteri Silky pocket mouse	SEN	S?			YES - juniper/desert grasslands
Plecotus townsendii pallescens Pale Townsend's (Western) big-eared bat	SEN	S?			YES - Caves, abandoned buildings
Sorex palustris navigator Northern water shrew	SEN	S			YES - High elevation stream
Spermophilus tridecemlineatus monticola White Mountains ground squirrel	SEN	S		YES	High elevation grasslands

Species	USFWS and USFS Status	District Species Status	Species Status in Action Area of Proposed Project		
			CH or PCH	Known to Occur	Not Documented but Habitat is Present
MAMMALS					
Tadarida brasiliensis Mexican free-tailed bat	SEN	S			YES - Dry forests, cliffs, foraging
Zapus hudsonius luteus New Mexican (meadow) jumping mouse	SEN	S			YES - High elevation stream
BIRDS					
Accipiter gentilis Northern Goshawk	SEN	S		YES - Nesting	
Accipiter striatus Sharp-shinned Hawk	SEN	S		YES - Nesting	
Botaurus lentiginosus American Bittern	SEN				YES - Luna Lake
Buteo albonotatus Zone-tailed Hawk	SEN	S		YES - Nesting	
Buteogallus anthracinus Common Black-hawk	SEN	S		YES - Nesting	
Buteo regalis Ferruginous Hawk	SEN	S			YES - Grasslands, open country
Buteo swainsoni Swainson's Hawk	SEN	S		YES - Wintering	
Casmerodius albus Great Egret	SEN	S		YES	Luna Lake
Catharus fuscescens Veery	SEN	S?			YES - Woody riparian
Ceryle alcyon Belted Kingfisher	SEN	S		YES - Nesting	
Charadrius montanus Mountain Plover	SEN	S?			YES - Open, flat, barren grasslands
Dumetella carolinensis Gray Catbird	SEN	S			YES - Woody riparian
Egretta thula Snowy Egret	SEN	S		YES	Luna Lake & Blue River
Empidonax traillii extimus Southwestern Willow Flycatcher	E/SEN	S	No.	YES - Nesting	
Falco mexicanus Prairie Falcon	SEN	S		YES - Nesting	
Falco peregrinus anatum American Peregrine Falcon	E/SEN	S	No.	YES - Nesting	
Haliaeetus leucocephalus Bald Eagle	T/SEN	S	No.	YES - Nesting and wintering	
Himantopus mexicanus Black-necked Stilt	SEN	S?		YES	Luna Lake
Numenius americanus Long-billed Curlew	SEN	S?		YES	Luna Lake
Nycticorax nycticorax Black-crowned Night Heron	SEN	S		YES	Luna Lake
Otus flammeolus Flammulated Owl	SEN	S		YES	Luna Lake
Pandion haliaetus carolinensis Osprey	SEN	S		YES	Ponderosa Pine Forests
Pelecanus occidentalis Brown Pelican	SEN	S		YES - Nesting	
Phalacrocorax auritus Double-crested Cormorant	E/SEN	S	No.	YES	Luna Lake transients
	SEN	S		YES - Nesting	

Species	USFWS and USFS Status	District Species Status	Species Status in Action Area of Proposed Project: CH or PCH	Known to Occur	Not Documented but Habitat is Present
BIRDS					
Pinicola enucleator Pine Grosbeak	SEN	S			YES - Open conif. forest
Plegadis chihi White-faced Ibis	SEN	S		YES	Luna Lake
Porzana carolina Sora	SEN	S?			YES - Lake, marsh
Recurvirostra americana American Avocet	SEN	S		YES	Luna Lake
Setophaga ruticilla American Redstart	SEN	S?			YES - Woody riparian
Strix occidentalis lucida Mexican Spotted Owl	T/SEN	S	PCH	YES - Nesting	
REPTILES					
Thamnophis rufipunctatus Narrowheaded garter snake	SEN	S		YES	Blue River
AMPHIBIANS					
Rana chiricahuensis Chiricahua leopard frog	SEN	S			YES - Ponds, tanks, Riparian
Rana pipiens Northern leopard frog	SEN	S?			YES - Ponds, tanks, Riparian
FISHES					
Gila robusta Roundtail chub	SEN	S			YES - San Francisco & Blue Rivers
Lepidomeda vittata Little Colorado spinedace	T/SEN	S	No		No - Not historic range
Oncorhyncus apache Apache trout	T/SEN	S	No	YES	Blue River tributaries
Pantosteus discobolus Bluehead sucker	SEN	S			No - Not historic range
Rhinichthys osculus osculus Speckled dace. Gila basin population	SEN	S			YES - San Francisco River
Rhinichthys osculus osculus Speckled dace. Little Colorado basin population	SEN	S			No - Not Historic range
Tiaroga cobitus Loach minnow	T/SEN	S	PCH	YES	Blue River
Xyrauchen texanus Razorback sucker No critical habitat designated on the Forests	E/SEN	S	No	YES	Blue River

Species	USFWS and USFS Status	District Species Status	Species Status in Action Area of Proposed Project		
			CH or PCH	Known to Occur	Not Documented but Habitat is Present
INSECTS					
Ameletus falsus False ameletus mayfly	SEN	S?		No - known only from Little Colorado at Greer	
Psephenus montanus White Mountains water penny beetle	SEN	S			YES - Cold, fast flowing streams
Speyeria nokomis nitocris Mountain silverspot butterfly	SEN	S?			YES - Seasonal wet meadows
PLANTS					
Allium gooddingii Goodding onion	SEN	S			YES - Mesic forests
Astragalus nutriosensis Nutrioso milk vetch	SEN	S?			No - Mesa tops in Nutrioso
Rumex orthoneurus Blumer's dock	SEN	S?			YES - Forest riparian
Senecio quarens Gila groundsel	SEN	S		YES	Forest riparian
Talinum humile Pinos Altos flame flower	SEN	S?			YES - Gravely soils

APACHE-SITGREAVES NATIONAL FORESTS
LIST OF
SPECIES OF CONCERN

These species were formerly designated as Category 2 candidates by the USFWS. None of them have been designated by the Regional Forester as sensitive species. There is no requirement to address these species in biological assessments and evaluations (FSM 2670.4). Change of status based on proposed rule published in the Fed. Reg. Vol 61(4): 7595-7613 (February 28, 1996).

Species	USFWS and USFS Status	District Species Status	Species Status in Action Area of Proposed Project		
			CH or PCH	Known to Occur	Not Documented but Habitat is Present
MAMMALS					
Idionycteris phyllotis Allen's (Mexican) big-eared (lappet-browed) bat	C2	S			YES - Forests, cliffs, foraging
Myotis ciliolabrum Small-footed myotis	C2	S			YES - Caves, cliffs, foraging
Myotis evotis Long-eared myotis	C2	S			YES - Coniferous forests, foraging.
Myotis thysanodes Fringed myotis	C2	S			YES - Pine, woodland, riparian
Myotis volans Long-legged myotis	C2	S			YES - Pine, woodland, riparian
Nyctinomops(=Tadarida) macrotis Big free-tailed bat	C2	S?			YES - Ponderosa pine, scrub
BIRDS					
Lanius ludovicianus Loggerhead Shrike	C2	S?		YES	
AMPHIBIANS					
Bufo microscaphus microscaphus Arizona southwestern toad	C2	S			YES - Blue River
FISHES					
Agosia chrysogaster Longfin dace	C2	S			YES - Blue River
Catostomus sp. Little Colorado sucker	C2	S			No - Not historic range
Catostomus insignis Sonora (Gila) sucker	C2	S			No - Not historic range

Species	USFWS and USFS Status	District Species Status	Species Status in Action Area of Proposed Project		
			CH or PCH	Known to Occur	Not Documented but Habitat is Present
FISHES					
Pantosteus clarki Desert (Gila mountain) sucker	C2	S			YES - San Francisco River
CLAMS AND MUSSELS					
Anodonta californiensis California floater	C2	S			YES - River, creeks
SNAILS					
Discus shemeki cockerelli Cockerell's striate disc snail	C2	S?		Insufficient data to make determination	
Fontelicella trivialis Three Forks springsnail	C2	S		No - distribution restricted to Three Forks	
PLANTS					
Gentianella wislizeni Wislizeni's gentianella	C2	S			YES - Shaded meadows, mixed conifer
Trifolium longipes var. *neurophyllum* White Mountains clover	C2	S			YES - Wet meadows, ponderosa pine